

DEC VS. IBM

1987 - 1992

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Information Services Program (ISP)

DEC VS. IBM 1987 - 1992

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Abstract

DEC's growth and penetration into traditional IBM markets over the past five years has been the subject of much discussion and analysis. Some of these analyses attribute DEC's success to the integrated nature of its VAX/VMS product line, others to IBM's "failure" in the mid-range market place. Whatever the causes, INPUT believes that the entry of DEC as a serious alternative to IBM for a variety of functional capabilities has, and will continue, to provide Information Systems executives with a growing range of alternatives and opportunities.

INPUT's research into the needs of Information Systems managers over the next five years indicates that they will be focusing on the integration of the technology and data, the productivity and responsiveness of the systems function and the application of technology for strategic business advantage. The emergence of DEC and a great variety of products to link it with IBM, coupled with IBM's emerging strategies for integration will offer solutions that might not have otherwise been available.

This report explores the current and future strategies of both vendors, and examines the effects of their strategies on third party vendors as well. It presents guidelines to IS executives which will permit them to gain maximum benefit from the DEC/IBM phenomena.



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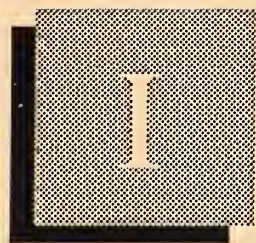
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Introduction





Introduction

This report is produced as one of a series of reports in INPUT's Information Systems Program (ISP).

A

Objective and Audience

Over the past five years Digital Equipment Corporation (DEC) has achieved significant penetration into a variety of markets traditionally viewed as belonging to IBM. Throughout this period DEC has achieved a credible reputation in both commercial and office systems and has expanded its penetration in the scientific and manufacturing arenas. During this same period, IBM has been largely unsuccessful in establishing a middle level processor or an integrated office systems strategy to effectively compete with DEC.

Meanwhile, Information Systems (IS) executives have faced increasing pressure from a variety of directions to look more seriously at distributed processing and data base environments as well as specialized departmental systems. This pressure, coupled with the lack of a single-vendor solution, has forced IS organizations to deal with multi-vendor environments.

This report's objectives, summarized in Exhibit I-1, are to examine the current strategies of both DEC and IBM and project their likely evolutions over the next five years. It presents INPUT's forecast of the primary issues confronting IS executives and assesses how well DEC and IBM will address them.

The study is primarily directed at Information Systems executives and planners for purposes of:

- Developing a user strategy vis-a-vis IBM and DEC.
- Identifying areas of compatibility and incompatibility between the two vendors.

- Providing guidance to IS management on opportunities for leveraging the strategies of each vendor.

EXHIBIT I-1

OBJECTIVES

- Examine the Future Directions of IBM & DEC
- Assess Future Capabilities in Critical Technologies
- Present INPUT's Implications for IS Management

B**Scope and Use****1. Scope**

This report analyzes and compares the historical and projected strategies of IBM and DEC, focusing on their respective business and marketing approaches and product and architectural strategies. Strategies relating to professional and network services and applications software are also covered.

The analysis goes beyond DEC and IBM to third-party suppliers of systems and applications software on the basis that the availability of such products and services is a very significant force in the application of each vendor's product lines.

There is no attempt to cover products and services of either vendor in depth; the focus is on mainstream architectural directions.

Some statistical information is presented on both vendors to give perspective. However, no attempt has been made to forecast market shares, product revenues, etc.

2. Organization

This report is organized as follows:

- Chapter II, the Executive Summary, summarizes INPUT's primary conclusions.
- Chapter III provides the historical perspective on both vendors.

- Chapters IV looks at both vendors' current and future strategies and product directions.
- Chapter V looks at user requirements over the next five years and examines how well the emerging strategies of DEC, IBM, and third parties are likely to meet IS management needs.
- Chapter VI presents INPUT's conclusions and provides recommendations to assist IS executive management in selecting strategies which will take maximum advantage of the likely directions of DEC and IBM.

C

Methodology

The majority of information used in the preparation of this report was obtained directly from the literature contained in INPUT's research library. Other sources of data included vendor and industry publications. The statistical information contained in Chapter III was derived from other INPUT research studies or obtained from outside sources as noted within the chapter.

Finally, three types of interviews were conducted.

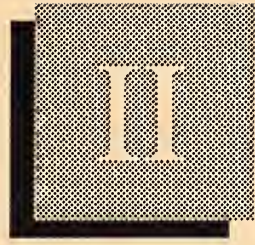
- One each with IBM and DEC.
- Five with key third-party vendors
- Two with leading institutions involved in assessing the management issues associated with information systems planning.

D

Related INPUT Reports

This report represents a continuation of INPUT's analysis of key IS concerns and issues, which have been covered in earlier INPUT reports from the Information Systems Program (ISP):

- *Departmental Systems and Software Directions (ISP)*
- *IBM Operating Systems Strategies (ISP)*
- *MICRO-Mainframe Corporate Impact (ISP)*
- *The Changing Dynamics of IS Organizations (ISP)*
- *Distributed Data Processing (ISP)*



Executive Summary





Executive Summary

An immense number of articles have been published within the last two years comparing DEC and IBM from every conceivable viewpoint. The two corporations have undergone analysis on a financial, cultural, product, and service basis by major business and technology publications. Most of this material has been focused on DEC's growing success in the marketplace and its penetration of IBM's markets in particular. Very little has been written to date which examines the impact of the emerging strategies of both DEC and IBM on the products and services that IS executives are likely to have available to them over the next five years. This report focuses on that user impact.

In particular, INPUT has attempted to:

- Look at the evolving business and technology strategies of both DEC and IBM to determine the directions and nature of their future offerings.
- Analyze the responses of third-party vendors to the developing strategies of DEC and IBM.
- Forecast the principal issues and needs that IS executives will be confronted with over the next five years.
- Make a preliminary assessment of how well the evolving products and strategies of DEC, IBM, and third parties will address the primary user issues.
- Provide recommendations for IS executives on approaches for obtaining maximum leverage from the developing environment.

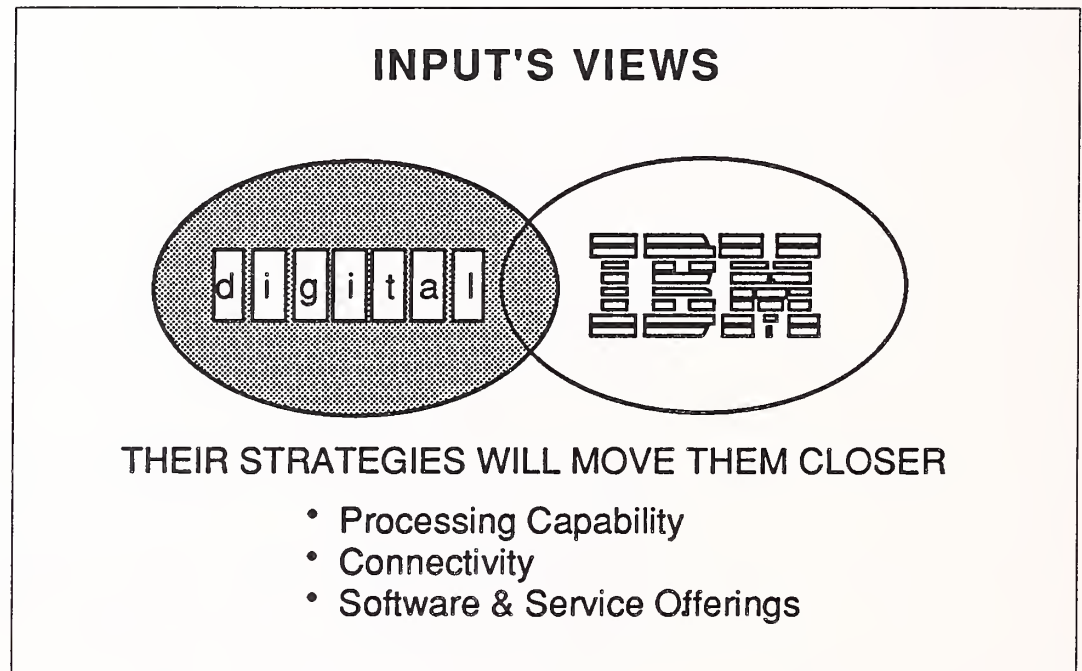
A

Primary Conclusions

All aspects of the research point to two primary conclusions:

- The strategies and product offerings of DEC and IBM over the next five years will move them significantly closer together in a number of areas of interest to IS executives, including raw processing capability, connectivity, software, and service offerings (See Exhibit II-1).

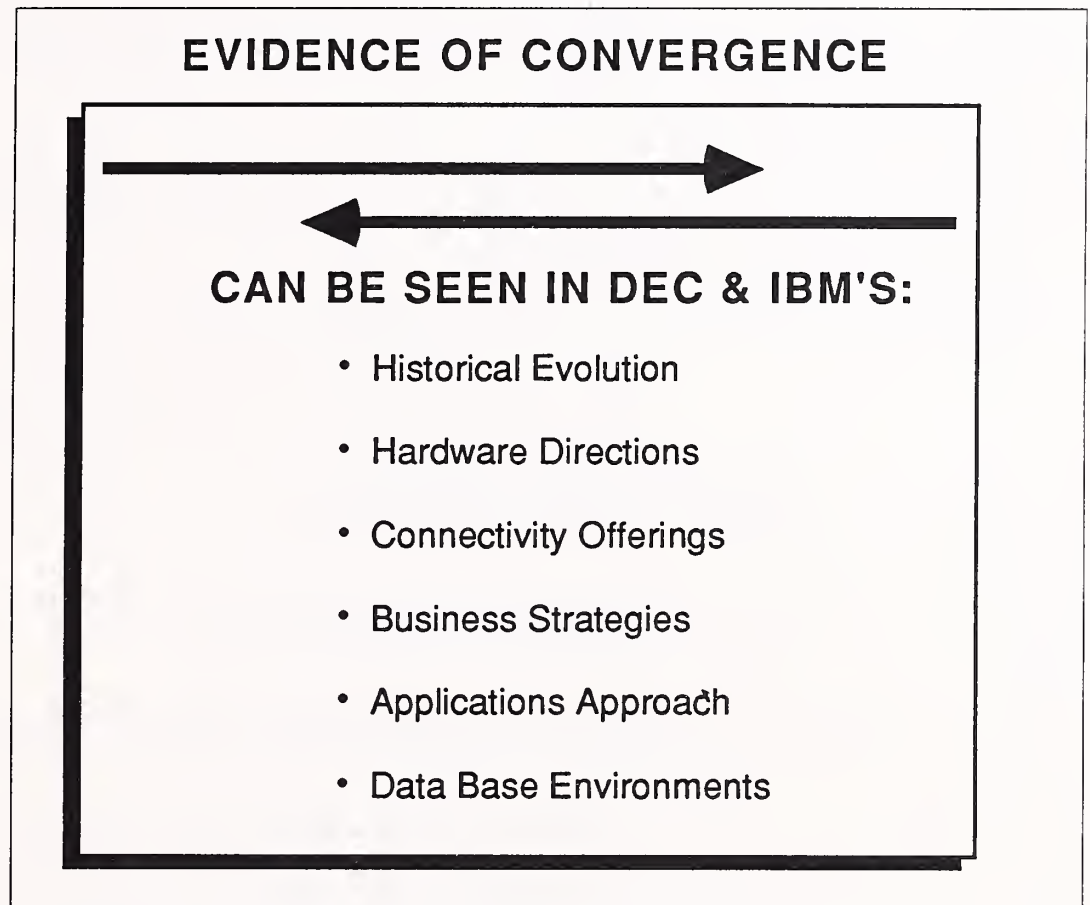
EXHIBIT II-1



- The dominance of DEC and IBM in the marketplace and their support of common standards and technology interfaces will place third parties in a position to:
 - Provide significant software offerings which can function with common interfaces across both vendors' architectures.
 - Fill connectivity and other product niches which DEC and IBM elect not to fill.
 - Play a key role in providing the foundation software for corporations which elect to run mixed networks of IBM and DEC products, particularly where there is a requirement to share data across the two architectures.

B**The Supporting Evidence**

The evidence for these conclusions can be found by examining the areas outlined in Exhibit II-2.

**1. Historical Perspective and Business Strategy**

IBM has historically approached the corporate world through the internal Information Systems function while DEC has focused on the end user. This fundamental difference in historical approach has a number of implications. For example:

- As more and more computing decisions have been made, or strongly influenced, by the user environment, DEC has had the advantage of its tradition of working directly with end users.
- On the other hand, IBM's approach, focusing on large systems and total environments, has permitted it to influence most corporations with regard to overall corporate architecture and network strategy.

Yet both DEC and IBM see a need to be more effective in the other's traditional area of strength and clearly intend to achieve this. Both are showing dramatic increases in marketing, sales, and customer support staffs, and both are focusing on being better at the total job. IBM will marshal these forces to be more credible in the application of mid-range

technology, to understand end-user requirements, and to deliver end-user and applications software. DEC will spend a lot of its energies convincing the people who control the large-scale commercial transaction processing world (the internal IS staff) that they have the capability to operate effectively in that environment. Over time, IS executives can expect both vendors to become more sophisticated in each other's area of historical strength.

Other domains where there have been historical differences (that appear to be diminishing as each vendor's strategy evolves) include a common emphasis on:

- Connectivity and migration paths across product lines.
- Heavy commitments to the software and systems integration business.
- The encouragement of cooperative development efforts with end users and third parties.
- More open communications with regard to their positions on product direction and standards efforts.

Implementation of these key future business strategies will present different obstacles for each vendor. For example:

- For DEC to take a strong position in the more lucrative software business, it will need to deal with the myriad of third-party developers who provided the software that helped make DEC what it is today and whose market DEC appears to want for its own.
- For IBM, the implementation of Systems Applications Architecture to achieve architectural integration will involve monumental investments which will need to be made in short order if the concept is to be sold to large numbers of users.

While both vendors are moving in some common directions, the way they get there will be dictated by how each utilizes its strengths.

- Sheer size, including installed base, untapped R&D, and other assets, will give IBM options that DEC will simply not have.
- DEC, on the other hand, is on a roll, and by focusing its energies and growing financial capability on a few target areas can move its strategies forward, perhaps more aggressively.

2. Product Strategies

a. Products and Architecture

As to product strategies, expect DEC to stick with a winner; the VAX/VMS unified product architecture is credited by most as the key to DEC's current success. It is through this architecture that DEC has developed the truly integrated set of product offerings listed in Exhibit II-3. With the same operating system running on all levels of processor power, DEC is able to offer users the ability to migrate applications up and down the power scale, preserving development investment. The missing link in DEC's strategy is the personal computer. INPUT believes that DEC will need to re-emphasize a position in this area soon (but coming back from the last attempt may not be easy).

EXHIBIT II-3

DEC'S INTEGRATED PRODUCT OFFERINGS

- VAX/VMS Integrated Architecture
- ALL-IN-ONE Integrated Office System
- DECnet Networking Products
- VAX Cluster High-End Offering
- Emphasis on Distributed Applications

IBM's current product line spans three different product architectures: the 370, the System 3/X, and the PC (Personal Computer). As the premier provider of large-scale transaction processing capability, IBM is without peer. But as users continue to look at integrating host and departmental applications, including office, the problems associated with mixing and matching IBM's array of products can become immense. This combined with IBM's inability to come forth with a truly price competitive and powerful "mini" to operate at the middle level of three-tiered network hierarchies has opened the door in many formerly "all blue" shops to DEC and other vendors.

To meet the growing user demand for integrated solutions IBM needs to patch its image in the mid-range and give solid evidence of providing migration and connectivity strategies across its myriad architectures and

operating systems. It is betting on the 9370 (and to some degree the new Silverlake) for the former and SAA for the latter. They both seem like good bets.

The 9370, discussed in more detail in Chapter IV, brings 370 architecture to the mid-range, allowing the migration of host applications if appropriate. More importantly, it appears that the product will have all the capability required to deal with the connectivity issues as well. Finally, based on announcements to date, it appears that IBM will be using this product to introduce support for Ethernet and a number of other industry standards not formerly supported by IBM.

Individual products aside, the key concept which will place IBM in the position of meeting user demands for increased integration capability is Systems Applications Architecture. Conceptually, SAA is a set of standards to be implemented across hardware and software product sets which will govern such functional capabilities as user access, applications consistency, programming interfaces, and communications support. In theory, users adopting the standards and IBM products (or third-party offerings) which comply with them would have the same kind of migration capability that exists today in DEC's unified product architecture.

From INPUT's viewpoint the significance of SAA goes well beyond achieving DEC-like application migration capability. For IBM, SAA establishes a core product strategy and will provide third-party developers with the necessary guideposts to facilitate the development of applications and applications enabling products. Finally, SAA formalizes IBM's support for development languages such as "C" and legitimizes the PC as a serious component for applications development. Exhibit II-4 summarizes INPUT's views on the significance of SAA.

EXHIBIT II-4

SIGNIFICANCE OF SAA

- Provides Guideposts for Third-Party Development
- Commits to Applications Migration Capability
- Establishes CORE PRODUCT Strategy
- LEGITIMATIZES:
 - The PC for Real Applications
 - "C" As a Primary Development Language

b. Connectivity

Connectivity is another area where the strategies of both vendors are coming closer together. Although DEC's Digital Network Architecture (DNA) and IBM's Systems Network Architecture (SNA) have little in common on the surface, a lot has been going on in the evolution of each which will bring the two closer together over the next five years.

Both rely on seven layered architectures. However, DNA was primarily conceived to support linking processors together in peer level networks. SNA, on the other hand, was originally focused on managing large hierarchical networks of terminals; hence, the two are far apart from a design standpoint. Yet each vendor has and will continue to enhance its products in ways which will increase the feasibility and practicality of mixing the two.

- The addition of the LU 6.2 Application to Application Program interface adds peer to peer (program to program) linkage to SNA.
- DEC has added a number of facilities to DNA including an SNA Gateway product which will permit the two to link up.
- Both IBM and DEC have acknowledged the need for and are implementing network management software to manage networks with nonheterogeneous processors.

So in the area of connectivity we see some further evidence that each vendor is giving customers more powerful capabilities to connect in a variety of ways within its own product line and is providing both network management and connectivity packages which will allow customers to link mixed environments. Where IBM and DEC fail to offer a particular capability, third-party vendors are jumping in to fill the gap.

c. Data Management

The situation is somewhat different in the area of data and data management software. Each vendor has its own product offerings for both hierarchical and relational data base environments. Both are continuing to provide enhancements.

- IBM will be offering the functional capability of its relational offering, DB2, across all major platforms under the SAA umbrella.
- INPUT expects that DEC will be announcing a distributed data base system based on its Relational Data Base (RDB) product in the near future.

However, there is no evidence to date that either IBM or DEC have intentions to create products that will port data either to or from their competitor's software. Here again, the third-party software vendors are taking a strong position. A large number of data base management and fourth generation language (4GL) products are already on the market which will function on both the DEC and IBM architectures. In addition, distributed data base offerings from companies like Oracle have the capability to process a data base distributed across both.

d. Conclusions

Although additional evidence is presented in Chapter IV, it should be apparent from the synopsis presented here that DEC and IBM will have moved significantly closer together in the capabilities that they offer and the way that they do business by 1992. While their key products and architectures will maintain their unique character (see Exhibit II-5), IS executives can expect to see a growing legion of products which will allow the two environments to communicate and operate with each other. Many of these products will be provided by IBM and DEC.

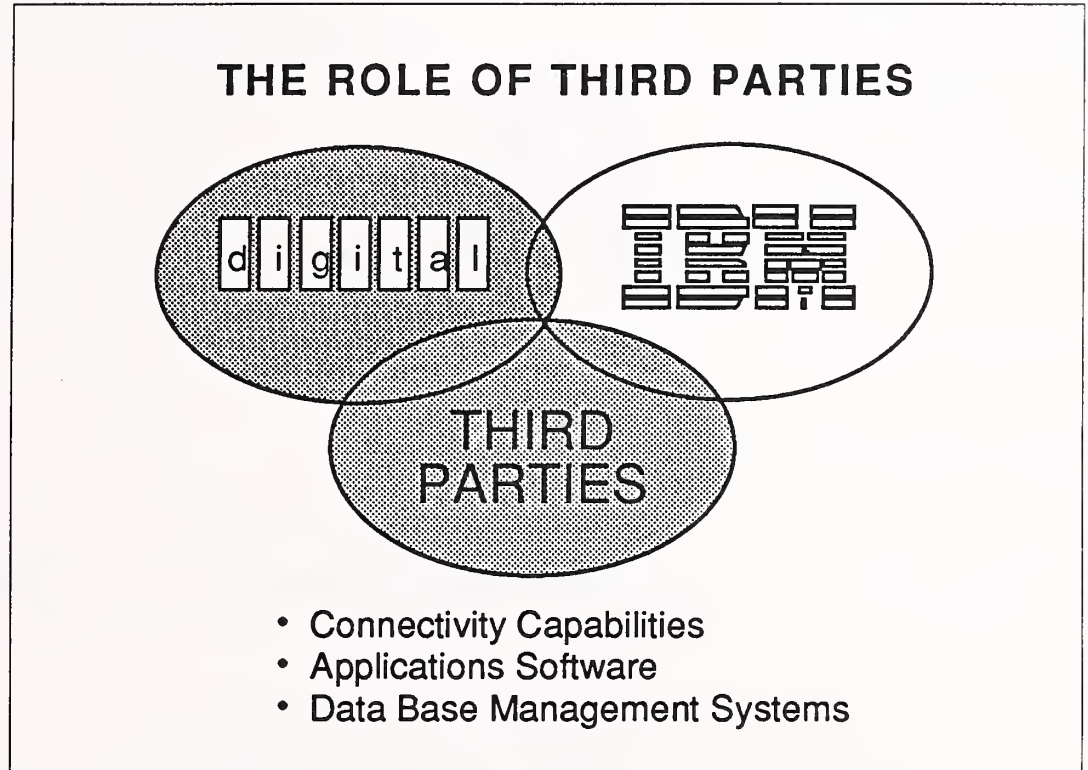
However, INPUT believes that a significant amount of the capability needed to bridge DEC's and IBM's architectures will come from third-party suppliers. As illustrated in Exhibit II-6, INPUT expects that these vendors will be particularly influential in:

- Providing connectivity, applications, and data base software.
- Filling gaps between the product lines that DEC and IBM do not fill for competitive reasons.

EXHIBIT II-5

KEY PRODUCTS AND ARCHITECTURES	
IBM	9370, 3090/Summit, PS2 Systems Applications Architecture Systems Network Architecture
DEC	VAX/VMS Product Line DECNET Network Management

EXHIBIT II-6



C

Meeting User Requirements

INPUT's research into IS management's requirements over the next five years identified several underlying driving forces which will be dictating future needs and creating new opportunities as well as challenges. These forces are:

- Advances in technology, particularly in the areas of data base management and middle level and micro-based systems and software.
- Increased demands by corporate management for IS to support business strategy in a direct bottom line manner, e.g., gaining competitive advantage.
- Business requirements that both centralized and decentralized systems operate effectively and adapt quickly to changing business conditions and procedures.

As a result of these forces and other environmental factors, INPUT believes that the majority of IS executives will have needs over the next five years which fall into three broad categories, as portrayed in Exhibit II-7:

- Technological Integration - Providing a solid and flexible network/infrastructure, integrated application interfaces, and relatively seamless data base environments.

EXHIBIT II-7

IS MANAGEMENT NEEDS	
AREA	NEED
TECHNOLOGY INTEGRATION	Infrastructure Data Management User Interfaces
MANAGEMENT OF IS	Productivity of IS Simplification of Support User-Managed Development
STRATEGIC AND ADVANCED SYSTEMS	

- Changes in Management Process - Harnessing and leveraging user-managed development while increasing the productivity of the IS function and simplifying support.
- Application of Extended Capabilities - Leveraging advanced technologies such as Artificial Intelligence (AI) and applications architectures to take advantage of strategic systems opportunities.

INPUT believes that the directions of both vendors coupled with third-party offerings will support the user needs identified in the research. For example:

- DEC's unified product architecture and IBM's commitment to SAA will provide the foundation for achieving flexible integrated networks.
- The further development of relational and distributed relational data base technologies will assist in dealing with the integration objectives in the data area.
- SAA will offer opportunities to simplify the environment, improve IS productivity, and leverage existing investments in applications.
- The strategies of both DEC and IBM as well as the offerings of third parties will yield a large number of new "off-the-shelf" applications packages over the next five years.

The question for user executives is how to take advantage of these evolving strategies.

D

Recommendations for Management

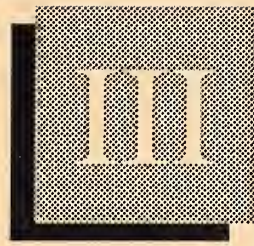
INPUT believes that the technology and business strategies of DEC, IBM and third-party vendors will provide a broad set of practical alternatives for effectively integrating vendor offerings over the next five years. However, many IS organizations which have traditionally been either IBM or DEC shops may lack the expertise to evaluate or implement these options effectively. IS executives wishing to leverage this capability will need to:

- Evaluate and adjust accordingly their in-house planning and implementation expertise.
- Consider the policy and cultural issues associated with adopting a truly “multi-vendor” strategy.

But even in situations where an organization has little intention or need to adopt a dual vendor approach there are a number of things INPUT believes can be done to leverage the strategies of each vendor.

- For shops which are IBM-dominated, it seems quite clear that restricting the selections of hardware and software to those that will be included in SAA will offer solid benefits and maximum flexibility.
- In situations where there is a need to connect the two vendors, but not necessarily integrate applications, IS managers should use vendor-provided gateway products.
- Where access to data for a given application requires getting at information stored in both environments, adopting one of the new distributed data base offerings will permit some level of data integration for some smaller applications.
- Tracking the developments for key products/strategies of both vendors is a good idea. For example, observing DEC’s moves in the PC arena and IBM’s 9370 and SAA offerings will give additional clues as to the direction of each vendor.

The strategies of both vendors, supplemented by those of third parties, will provide IS management over the next five years with significant opportunities to mix and match. The technology will permit those who are compelled to centralize, to centralize, and those who are inclined to decentralize to accomplish it gracefully. In short, the tough job will be identifying the technology strategy that is most suitable to meet corporate needs.



Background





Background

To understand the future directions of IBM and DEC and the impact on available technology, it is useful to look at the two companies from several points of view including:

- Current financial and market positions.
- Historical perspective.
- Business strategy.

This chapter focuses on the background of each corporation as well as their likely future business strategies. Section A deals with some overall market and financial comparisons. Section B focuses on historical perspectives and likely future business strategies.

A

Comparing the Corporations

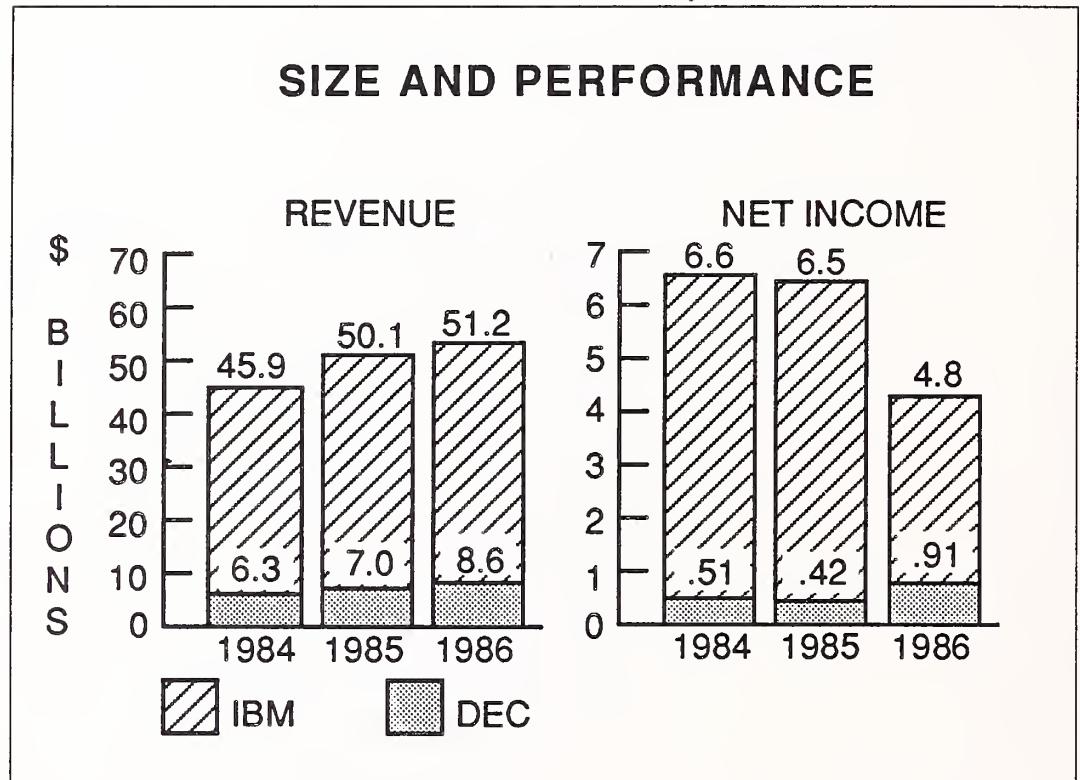
The sheer difference in size between DEC and IBM influences the nature of each organization's strategy as well as their capabilities to respond to the competitive environment. To cite some comparative statistics:

- IBM is a \$51 billion dollar company and DEC an \$8.5 billion dollar company, a 6:1 ratio that shrinks rapidly to 3:1 over the next five years at current growth rates.
- Despite DEC's phenomenal growth in the mid-range market over the past five years, IBM has sold more than 240,000 System/3X type processors.
- In 1986 IBM did about \$5 billion dollars of captive software business and DEC perhaps \$350 - 450 million.

Nevertheless, *Business Week* reports that DEC's net income increased 80% for the year ended June 30th to \$1.1 billion on a 24% increase in revenue to \$9.4 billion while IBM's financial performance fell well below its own expectations.

It would be hard to argue with DEC's success over the past five years. Exhibit III-1 summarizes the financial performances of both DEC and IBM for the period 1984 - 1986.

EXHIBIT III-1



Finally, while the primary battle lines between DEC and IBM appear to be drawn in the \$9 billion mid-range market, it is necessary to look beyond their mid-range strategies to assess user impacts of both vendors' offerings.

B

Corporate Fundamentals

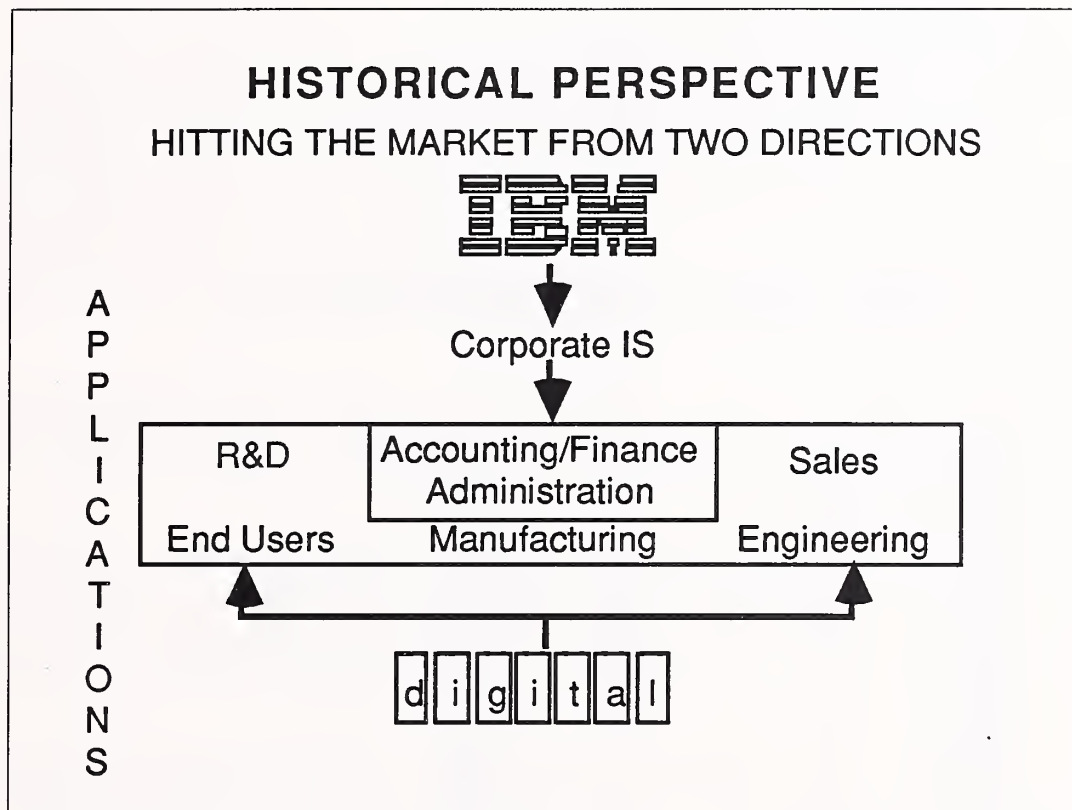
1. Historical Perspective

IBM and DEC have always approached the customer from different directions. Exhibit III-2 illustrates this difference in approach.

a. IBM

IBM entered the world of computing through the administrative door. From the time of its early tabulator systems forward, IBM has built a strong relationship with the central financial and administrative organizations of corporate America. As data processing has grown, IBM has

EXHIBIT III-2



found its primary alliance to be the corporate IS (Information Systems) function. Although frequently a love/hate relationship, this alliance has served IBM well over the past 30 years and remains a central theme of its marketing strategy.

Traditionally, IBM has been an organization driven by marketing. Business decisions from strategy to product release have been focused on the bottom line. IBM has diverted from this strategy only one time. In the late seventies IBM established a primary objective of being the low-cost producer of quality data processing equipment. During that period it invested billions in retooling its manufacturing and delivery processes. Some would argue that during this diversion IBM failed to be sensitive to shifts in market requirements for distributed and end-user systems. Whatever the case, IBM has clearly shifted the emphasis back to marketing and sales.

Until recently IBM has been threatened with potential breakup by the government. Many industry watchers feel that this threat has had a strong influence on IBM's failure to pull together an integrated product strategy. Being integrated isn't healthy if you're going to be disjoined. This legal threat appears to be gone and could explain a lot of changes in IBM's behavior.

b. DEC

DEC started its business by selling directly to scientists and engineers. It has its roots in digital technology. Originally supplying its customers with "do it yourself" circuits, DEC soon began to assemble its own circuits into the PDP-1. The rest is history. With the PDP-11 DEC pioneered multi-user departmental computing. Observing the growing and changing requirements of its customers, DEC adopted a strategy of supplying migration paths early on.

While paying attention to individual users and local departmental requirements, DEC until recently has stayed clear of corporate IS. Its primary focus has always been on the end user of its products and software.

Historically, DEC has nurtured third-party suppliers in cooperative development efforts. These relationships have been a cornerstone to DEC's market penetration. As will be discussed later, there is some question about how DEC will deal with that strategy in the future.

Most analysts would agree that DEC's current strength has resulted from its focus on a "unified" product architecture. This has not always been the case. In the recent past DEC was pursuing a dual architectural strategy with the DEC 10 & 20 systems. The decision to abandon this product line and its successor, Jupiter, was costly for DEC, but probably strategically correct for the long term.

Above everything else, DEC seems to be a company which has focus. Having made some key strategic decisions from both a business and technological viewpoint, it has been able to "get on with it," concentrating its more limited resources on doing what it intends to do extremely well.

2. Business Strategy

The business strategies of both corporations are undergoing change. The following section compares DEC and IBM and examines some shifts in business strategy which INPUT believes will impact users over the next five years. Chapter IV focuses on products and architectures.

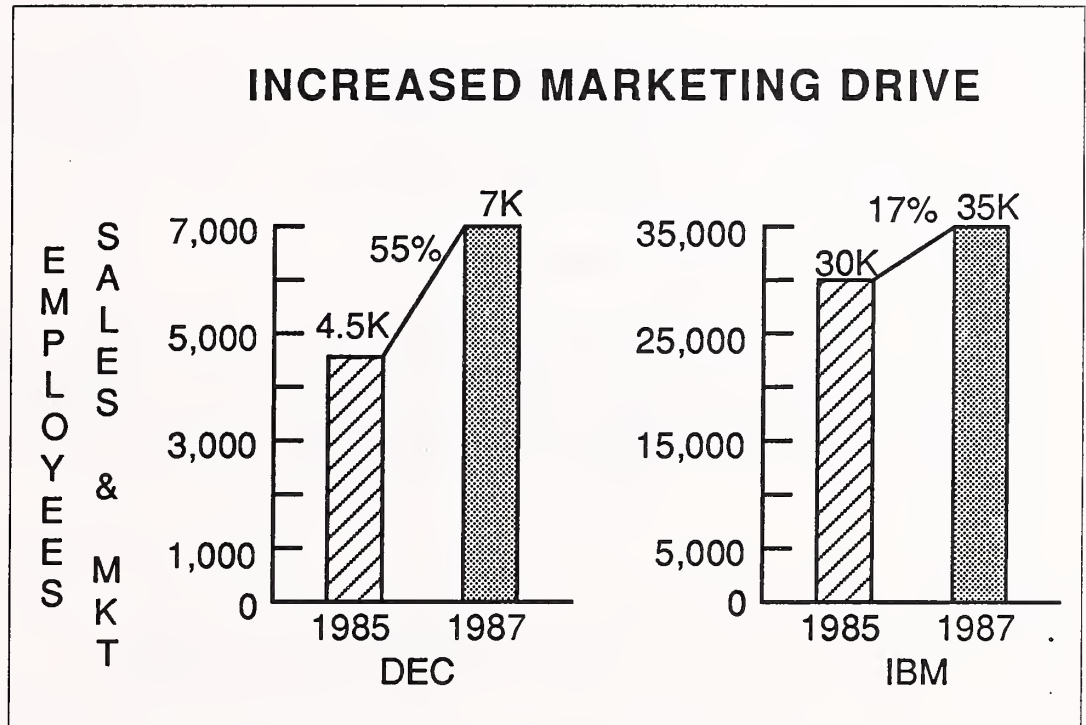
a. IBM

IBM will continue to place emphasis on strategies that have proven successful over the past twenty-five years, including:

- Focus on the internal IS function.
- Presence in almost all aspects of the information systems products and services business.

- Emphasis on marketing. In the last 18 months IBM has put 5,000 staffers in the field for marketing and sales and service and has plans to tap Rolm for perhaps another 6,000. This would bring IBM's total army in this area to somewhere over 35,000. Exhibit III-3 illustrates the commitment of both vendors in the marketing arena.

EXHIBIT III-3



- Leadership in storage technology. No one has done better in this area than IBM. IBM holds over 80% of the US market for large capacity mass storage systems and has been phenomenally successful in carrying the sale of these high-profit peripherals along with its processor sales.
- Utilization of product and service pricing to optimize product life-cycles and control the introduction of new technology.
- Emphasis on basic research with a heavy focus in the materials and software areas.

Some significant changes in IBM strategy which will have lasting impact are:

- Heavy emphasis on the area of applications software through the encouragement of cooperative development efforts; their agreement with LOTUS is just one example.
- A growing market position in systems integration and large custom development efforts as exemplified by recent major contracts with Ford (\$200 million) and Hospital Corporation of America (\$50 million).

- A growing willingness to propose and, in fact, manage the implementation of multi-vendor solutions.
- A shift to “open communications” with customers and “open architectures” in general to facilitate planning for both users and third-party vendors.

Finally, IBM will focus its business on technology products that support the concept of Systems Application Architecture (SAA) adopting, at last a product strategy which supports the concept of multiple migration paths and simplified connectivity.

b. DEC

The most significant contributor to DEC's success has been its unified product architecture. This combination of hardware, operating system, and connectivity products will remain the backbone of DEC's product strategy over the next five years. Other areas where DEC will continue with its current business direction will be:

- Use of cooperative development strategies with third-party suppliers.
- Support of industry standards efforts.
- Utilization of its positive press and the endorsements of users in market development.
- Continued marketing to end users.

Areas where DEC's strategies are changing include:

- A direct invasion of IBM's mainframe turf with expansion of its VAX 8970 “cluster” products.
- An increasing commitment to marketing and sales as reflected in DEC's 55% growth in sales force to 7,000 since 1985 (see Exhibit III-3).
- A reentry into the microcomputer market with an initial emphasis on engineering and high-powered workstations.
- A strong commitment to get more revenue out of the software business.

EXHIBIT III-4

KEY FUTURE BUSINESS STRATEGIES

IBM	Focus on Product Integration Open Communications Encourage Cooperative Development
DEC	Continue Unified Product Architecture Develop Upward Expansion of VAX/VMS Re-enter into Micro Market
BOTH	Grow Software and Services Expand Systems Integration Services

3. Observations

One conclusion that can be drawn from examining the business strategies of both IBM and DEC is that they are beginning to look more alike than different in a number of ways.

- Increased focus on marketing and sales.
- Commitment to connectivity and migration paths across product lines.
- Heavy commitment to the software and systems integration business.
- Encouragement of cooperative development efforts.
- Candor on product direction and commitment to supporting industry standards.

Notwithstanding these directional intents, different but significant problems will need to be overcome by both IBM and DEC in order for them to effectively implement their strategies.

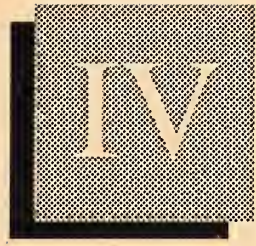
The trend toward distributed processing favors DEC's product line in the current market. Still, DEC will need to make significant investments to re-establish itself in the PC market place where IBM's products have established the architectural standard. Furthermore, if DEC really wants to play in the mainframe game, significant investments will need to be made in operating systems and storage technology.

DEC's longstanding and stated future commitment to third-party cooperative efforts has allowed it to conserve capital yet make available to customers a rich set of hardware and software offerings. But this sword is double-edged. In order for DEC to move effectively into the higher margin software and peripherals businesses, it must to some degree bite the hand that feeds it. Two cases in point:

- The reaction to DEC's recent policy statement restricting the transfer of DEC software licenses has many third-party vendors offended.
- The VAXBI proprietary (read closed) bus architecture and DEC's restriction of its use to third parties who "do not compete" with DEC and whose product plans have been "sanctioned" by DEC has others infuriated.

Entering the game late with a unified architectural strategy, Systems Applications Architecture (SAA), IBM will need to make huge investments to pull together the software and hardware to make the concept a reality. Just dealing with the sheer numbers of incompatible operating systems, communications architectures, and interfaces slated for conformity with SAA will be an awesome task.

Exhibit III-4 summarizes the key business strategies as they are likely to unfold for both vendors over the next five years.



Current And Future Product Strategies





Current and Future Product Strategies

This chapter discusses the principal product strategies of both vendors, focusing on the core products and architectures which will determine available user functionality, including:

- Primary hardware offerings.
- Applications and applications environments.
- Connectivity and network architectures
- Specialized capabilities including office and engineering.
- Software and services.

A

Strategic Products

1. An Overview

a. IBM

IBM's hardware product line is built around three basic computer architectures:

- Personal computer PC.
- System/3X encompassing the System 36, System 38, and their precursors.
- System 370 including 308X, 43XX, and 3090 series.

IBM probably has a 75% market share and is the undisputed leader in the mainframe market. The 3090 Sierra series is the current high-end offering with the 43XX systems on the low side. The Sierra is in the middle

of its life-cycle. IBM's timing of the release of the follow on product, Summit, will be more dependent on its ability to sustain sales of the Sierra than anything else. With the life-cycle for IBM's most recent products running about three and a half years, we can expect to see the Summit in the beginning of 1989.

The real alternative to IBM mainframes comes from the plug compatible vendors such as NAS and Amdahl. In either case, the architecture remains basically "blue." While both competitors claim better price performance than the current Sierra line, IBM can accomplish its objectives of extending the Sierra's life through two approaches which will also benefit users:

- Performance improvements through the use of micro code.
- The time honored-technique of price slashing.

IBM's mid-range has been an evolving and somewhat difficult area for the company. The S/3X line of offerings, originally targeted at small and intermediate businesses, has evolved around the applications requirements of smaller users. Historically, for the S/32, S/34, and today's S/36, the requirement was for an easy-to-use turnkey solution for non-data processing users and smaller environments. While thousands of applications and extensive communications facilities are available for the S/36, the system is perceived by most large establishment IS executives as ineffective in the role of middle-level processor in three-tiered networking environments.

IBM's other mid-range offering, the S/38, was designed to meet the requirements for internal applications development with limited development resources. There is no question that this system achieved these objectives, providing exceptional programmer productivity through a unique approach to data base technology. However, the system to date has suffered from limited expansion capability which has frustrated many otherwise satisfied users and certainly cannot be considered a serious candidate for the middle-level processor in a large scale three-tiered network.

Today the S/36 and S/38 have grown together in features and functions including a rich set of communications and networking capability, with migration capability across the S/3X product offerings through conversion tools and aids. The announcement of yet another S/36 offering in October of 1987 lends credence to IBM's commitment to the entire product line with Silverlake (discussed in the next section) as perhaps the successful integration of the line.

IBM's new S/370 offering, the 9370, focuses on delivering features and functions to enterprise and departmental users of larger establishments.

The 9370 leverages customer and developer investments in S/370 based software and provides the key to migration missing from the S/3X architecture. It represents IBM's primary thrust in the mid-range for large establishment users and will be discussed in detail in the next section. "DEC Beater" or not, this new offering is pivotal for both IBM and users.

IBM's April announcement of the PS/2 line of personal computers is significant to corporate information systems organizations for several reasons:

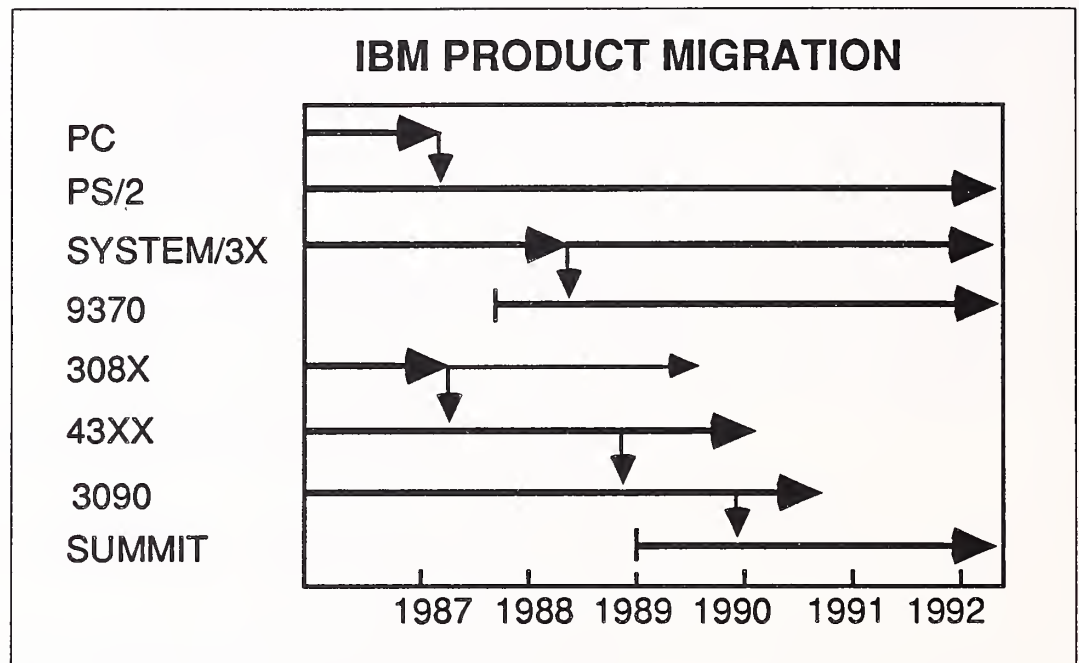
- It certifies the commitment to the DOS operating system, and consequently a reasonable migration path for existing applications.
- It provides the PC (through the new operating system) with the capability to participate fully in corporate networks.
- And although not available in current releases of the hardware and software, the PS/2 will have the capability to simplify the introduction and management of PC's in both corporate and stand alone environments.

To sum it all up IS executives can bet on the following scenario for key IBM products:

- 9370 as the primary focus for the mid-range with the Silverlake 36/38 follow on providing a extended life to that product line.
- 43XX in an interim role.
- 308X at the end of its line.
- 3090 is important now, as a migration target for the 43XX machines, and as the logical migration path into the Summit environment.
- PS/2 as a legitimate platform for real business applications.

Exhibit IV-1 summarizes INPUT's views on the migration plans for IBM's primary product offerings over the next five years.

EXHIBIT IV-1



b. DEC

DEC's primary offering has been and will continue to be the DEC/VAX line of computers running under the VMS operating system. Spanning a wide power range from desktop to super-mini, this integrated line of products has been the key to DEC's success over the past five years and offers more than an adequate platform for continued development.

The VAX 8970 cluster is DEC's current answer to providing mainframe levels of MIPS (Millions of Instructions Per Second) comparable to the IBM Sierra. It represents DEC's first foray into that very "blue" turf. However, the cluster lacks the software and hardware to make it truly competitive for certain types of high-volume transaction processing. MIPS aside, the Vax 8970 cluster is no more a mainframe than the 9370 is a VAX.

DEC's failure in the area of personal computers leaves it with no offerings comparable to the PS/2. Also, it is unlikely that DEC will come into the clone wars with an IBM look-alike. Yet INPUT believes that DEC does not want to see itself wedged firmly between a 3090 on one side and a PS/2 on the other and will build a line of products over time that will provide comparable function and connectivity to the VAX environment. Section F discusses some recent DEC initiatives in engineering workstations which might provide a clue to future directions.

Finally, a key component of DEC's strategy is the ability to migrate workstations from one environment to another. This is certainly not the case in the IBM world today, and represents a strength of DEC's which will be carried forward as the VAX line evolves.

2. IBM In the Mid-Range

IBM is looking to the 9370 series as the answer to its difficulties in the mid-range. Announced last year, the system drew some mixed reaction, but was generally perceived to be impressive on a price/performance basis. Hailed as IBM's head-to-head offering for the VAX, the 9370 was clearly conceived to solve several other problems for IBM including:

- Provide a 370 architecture in the mini category capable of running applications developed originally for the mainframe environment.
- Offer a platform with enough versatility to provide a migration path for S/3 (Systems 36/38) users who elect to make the move.
- Offer a central hub to support the transition to the common communications interfaces promised under Systems Applications Architecture (SAA).

Prices for the various models of the 9370 range from \$30,000 to \$210,000 without any peripherals. Under the covers the 9370 is a RISC (limited instruction set) machine. This means processors like the 8100 can be easily emulated. Limited editions of the 36 and probably the 38 can be implemented in a similar way.

Although initially criticized for its communications offerings, recent announcements are clearly impressive, extending its capabilities to support all major communications protocols and device types.

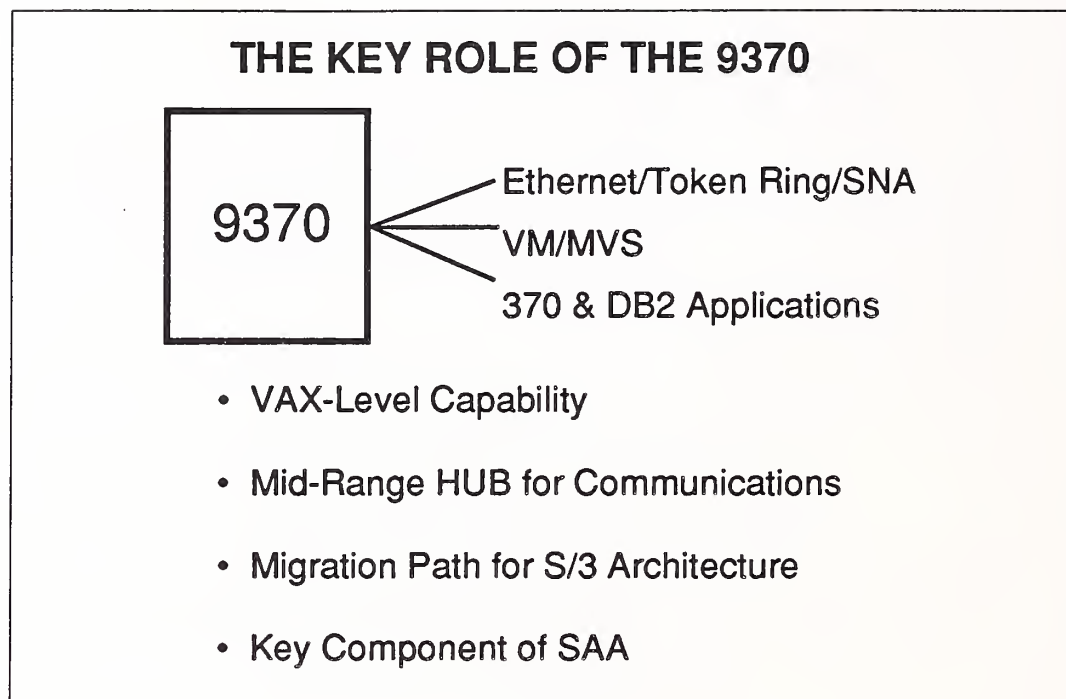
In the area of operating systems there is something for everyone:

- VM/SP will likely emerge most suitable for supporting departmental and work group applications.
- VSE/SP can be utilized where intensive batch processing is required.
- MVS/SP on the larger 9370 models will enable users to transport applications developed on large mainframes directly to the 9370.

The operating system which seems to be leading the way is VM/SP. It's significant to note that VM/SP has announced support for token ring networks and, for the first time, Ethernet. As illustrated in Exhibit IV-2, the 9370 will have capabilities to support connectivity to environments not previously considered part of IBM's architecture.

At the same time, the 9370 would appear to have some problems. As an office systems machine it is likely to leave a lot to be desired, at least until SAA brings some semblance of order to IBM's office offerings.

EXHIBIT IV-2



Physical suitability for the office environment has also been questioned by some observers. Nevertheless, we can expect to see a desktop version of the system which will correct any significant ergonomic issues over time.

IBM's mid-range strategy, while heavily focused on the 9370, does not exclude pulling the rest of its act together. Overall strategy for IBM's mid-range products is coordinated by a single division, Systems Products.

The much discussed Silverlake will offer IBM's many System 36/38 users a migration path which will protect their application investments. This machine, anticipated in the second half of 1988, will be built on the 9370 chassis and should benefit on a price performance basis from this newer technology. Other recent announcements which indicate IBM's on-going commitment to products other than the 9370 follow:

- IBM has announced enhancements to the S/36, indicating that it will remain committed to the system even after it brings out the Silverlake, (S/36-S/38) offering.
- IBM will likely port its relational data base offering, DB2, and SQL to the Silverlake, bringing it into compliance with SAA standards.
- The RPG programming language will be made to conform to SAA for the full line of S/3 processors.

Even lacking the richness of software of the DEC VS, the 9370 has been able to stem the tide of defectors within IBM's coveted large accounts.

(IBM still can change the market with a promise everyone else better deliver.) In fact, IBM has accelerated its shipment schedule for these devices because of the surge in demand. Finally, from the point of view of the IS executive, IBM's strategy in the mid-range offers at last a full range of alternatives for coping with distributed processing.

B

Applications and Applications Architectures

Both IBM and DEC are committed to being in the applications software business for a number of reasons:

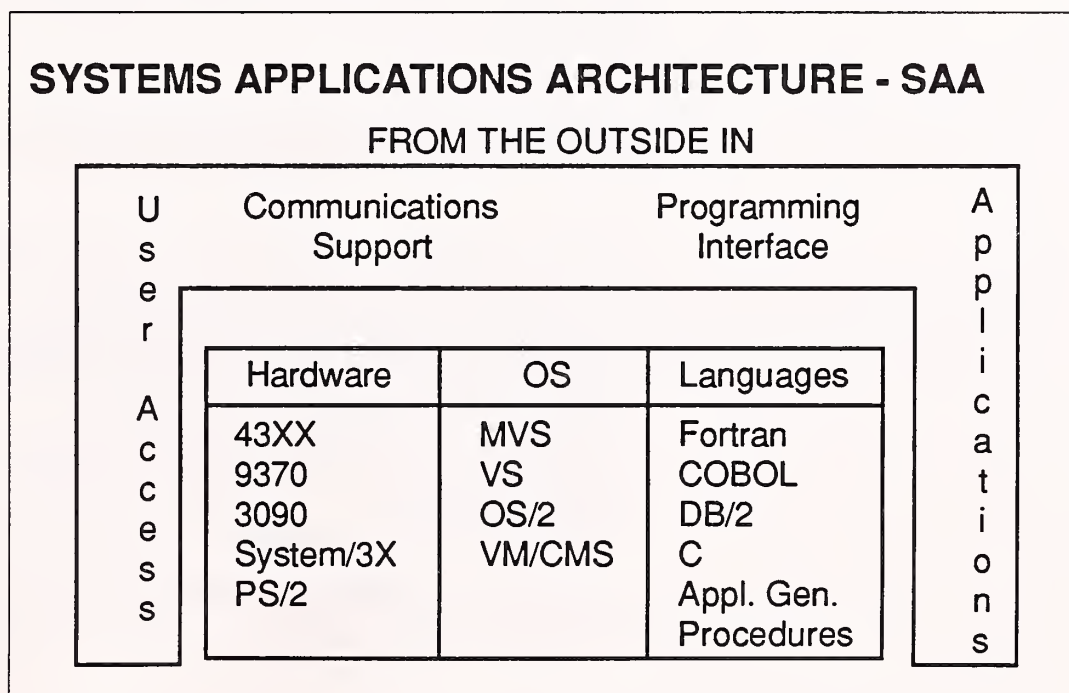
- With personal computers and increasingly in the mid-range, end users call the shots on applications functionality. They buy the application first, and the hardware follows. It moves the "iron."
- As pointed out in Chapter III, margins on software and services are significantly better than on hardware, and both vendors want more of that action.

1. IBM

Systems Applications Architecture (SAA) is pivotal to IBM's strategy in the applications area. In some sense SAA will do for applications and data portability what SNA has done for connectivity between IBM's various hardware offerings. And IBM is gearing up to implement SAA in about one third the 13-year timeframe that it took for SNA.

The key concept behind SAA, summarized in Exhibit IV-3, involves the creation of a set of standards and the declaration of products (both hardware and software) which will conform to the standards over time.

EXHIBIT IV-3



SAA defines four layers of standards including user access, applications consistency, programming interfaces and communications support.

- Key products already announced for inclusion under the SAA umbrella include DB2, SNA, LU6.2, COBOL, FORTRAN, C, etc.
- Primary hardware platforms announced for SAA include all the 370-based products including the 9370, the PS/2, and certain other components of the S/3 line.

To accomplish the implementation of SAA, IBM has revamped its product development process to guarantee conformance to SAA standards. Other important concepts:

- SAA is an overlay strategy. It does not replace previously expressed strategies, but in fact pulls them together.
- Any program product or standard announced for SAA will be implemented with 99-44/100 percent exactness across all included hardware platforms.
- The IBM development organization responsible for each platform agreed in advance to the ground rules prior to being announced as an SAA component.
- Additional products and standards will be announced over time.

The significance of SAA should not be underestimated. It provides users and third-party developers a clear set of products and standards which allow (over time) the same kind of applications portability that DEC obtains through its unified VAX/MVS product architecture with its current offerings.

Finally, IBM is working in other arenas to ensure a strong position in applications software. IBM has:

- Set up a task force to find ways to port applications from DEC, HP, and other competitors to the IBM 9370.
- Purchased major software companies such as Hogan Systems to supply vertical applications products.
- Entered into cooperative development agreements with companies such as LOTUS.
- Adopted an unprecedented willingness to discuss future plans with both users and developers.

2. DEC

Traditionally, DEC has been close to users and their applications. Starting with the engineering and scientific community (see Section F), DEC has moved aggressively to become a significant player in the administrative, financial, and manufacturing applications world. In addition, huge amounts of applications software have been developed for the DEC VAX/VMS environment by third-party vendors, some of it through cooperative efforts with DEC. This practice will continue, providing IS executives with a rich portfolio of potential off-the-shelf applications code.

In recent months DEC has made several major statements regarding applications software. Whether developed by third parties or internally DEC, will focus on:

- Applications which will take advantage of DEC's capability in distributed systems.
- Software which will ensure that no application code need be rewritten to handle data bases distributed across multiple processors.

Another component of DEC's strategy in the applications area is the creation of Application Centers for Technology (ACTs). The objectives of these centers are to:

- Promote better understanding of DEC products.
- Provide customer service and support the marketing function.
- To demonstrate connectivity of DEC and non-DEC products.

The first of these centers is open in New York, and DEC plans to open up 17 of these facilities worldwide to focus on all types of business and scientific applications.

C

Connectivity and Network Architectures

Connectivity may be the most discussed and critical component of both DEC's and IBM's strategies. In large user organizations, networking capability is the key factor in determining:

- Strategy with regard to decentralization.
- Ability to integrate existing operations.

1. Network Architectures (SNA/DNA)

a. Systems Network Architectures(SNA)

IBM recognized over 13 years ago the need for an architecture to support communications and data exchange between its products. Introduced in 1974, SNA's actual implementation has evolved to accommodate new hardware and software developments over the past 13 years. It remains today the key component of IBM's strategy for connectivity. A de facto industry standard for intersystem communications, SNA defines the structure, formats, rules, and controls for transmitting data through networks and for managing and operating the network.

SNA is a seven-layer architecture, defining services at each layer which rely and build upon the layers below. Physical control is at the low end of the hierarchy and transaction services at the highest. This layered approach allows IBM to replace or enhance one layer without affecting the others and has been the key to adapting the architecture to changes in technology and user requirements.

Conceived primarily to manage hierarchical networks, IBM has been working furiously to introduce peer to peer support into SNA primarily through the introduction of LU 6.2/APPC, Advanced Program to Program Communications.

Other vendors have recognized SNA as a de facto industry standard.

- The Orion Group recently announced software to enhance native SNA capabilities.
- Wang and Data General have jumped on the band wagon to implement IBM's peer-to-peer networking schemes.

b. Digital Network Architectures (DNA)

DNA, the use of Ethernet as the local transport, and the implementation of Open Systems Interconnect (OSI) standards are the underpinnings of DEC's networking strategy. DNA, implemented through DECnet, is also a seven-layer architecture, but cannot be compared directly to SNA; Exhibit IV-4 gives a comparison of the two architectures. DNA is essentially focused on linking processors, SNA on managing large networks of terminals. Exhibit IV-5 illustrates this fundamental design difference. They both have their advantages, but IBM still comes out the clear winner when it comes to managing huge networks of workstations.

EXHIBIT IV-4

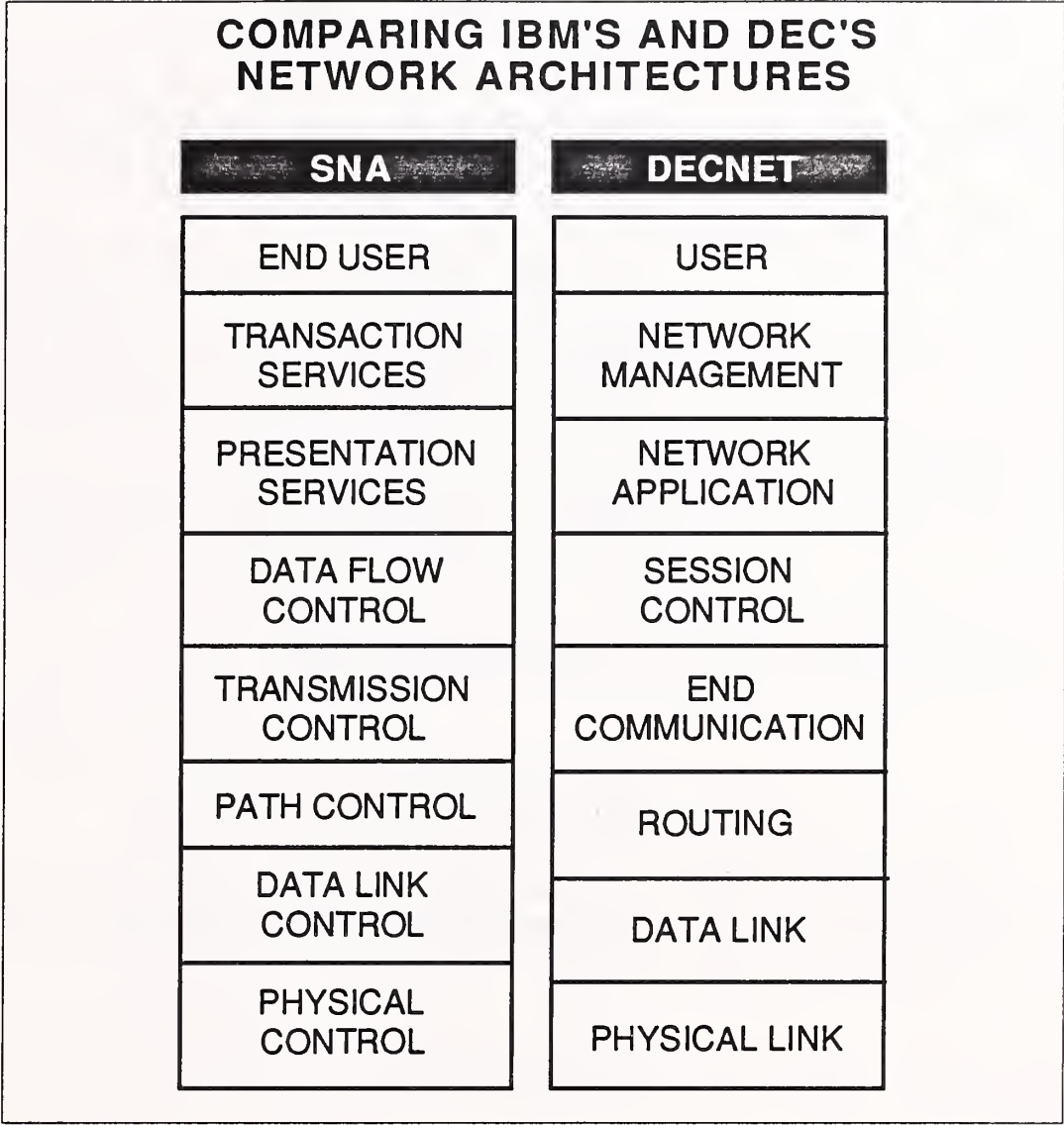
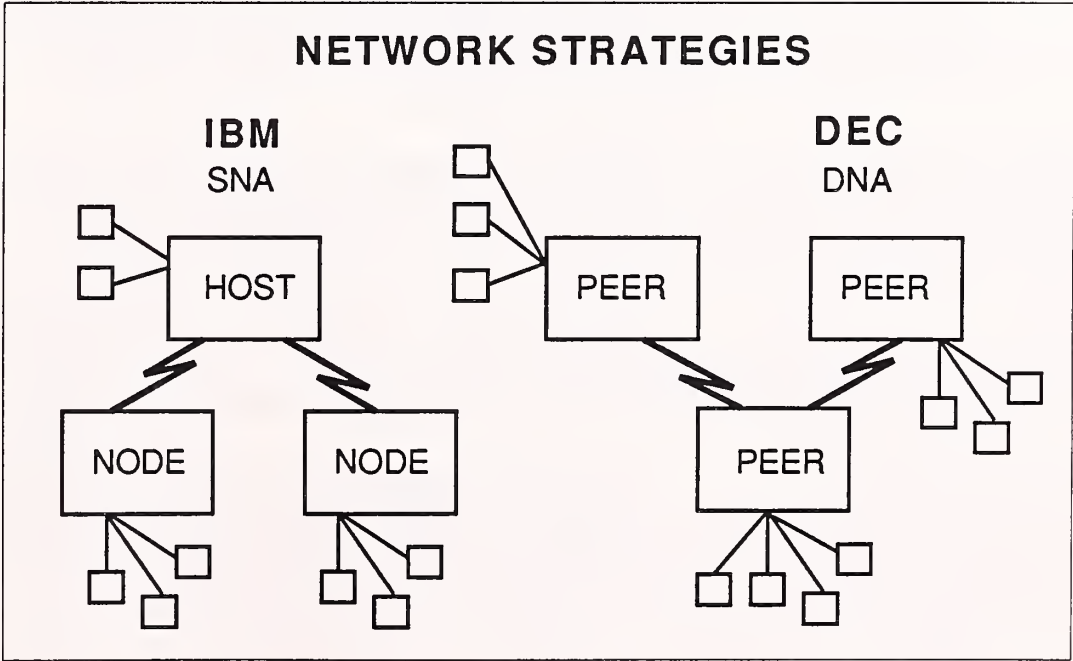


EXHIBIT IV-5



2. Network Management

A critical element to the success of both vendors strategies is the provision of sophisticated network management tools. IBM's NetView and DEC's Network Management Control Center, (NMCC)/DECnet Monitor VMS go head-to-head in this arena.

The 1986 announcement of NetView and the 3720 remote front end processor set the stage for IBM's offering. IBM is totally refocused in this area and is moving very aggressively. NetView, like SNA, is rapidly becoming a de facto standard that third parties and DEC will be forced to deal with in order to connect to NetView managed networks.

Finally, it is significant to note that IBM recently announced that NetView will have the capability to manage both IBM and non-IBM resources under all System/370-based operating systems.

3. Linking The Two

It is somewhat of a curiosity that DEC's public position is frequently to deny the existence of IBM de facto standards. At various times within the last year DEC has publicly stated:

- It would "shy away" from IBM de facto communications architectures in favor of implementation of the OSI standards.
- That LU 6.2 is not a standard despite the fact that many of the nation's largest corporation are spending vast sums of money on LU 6.2 applications development.

Yet DEC has or will provide a complete line of gateway offerings through its DEC Internet family of products including:

- SNA Gateway.
- SNA VMS DISOSS Document Exchange Facility.
- Several emulation packages.
- And ultimately, APPC/LU 6.2 (application to application) capability.

If DEC doesn't provide it, third parties will:

- Systems Strategies Incorporated (SSI) has scheduled a fourth quarter introduction of an extension to its VAX-Link networking family that is based on LU6.2 and T2.1 protocols.

- AST Research's new offering AST-220 will provide IBM PC users with a way to connect to the DEC VAX.
- Products are there to support Macintosh fans as well. VMacS is just one example.

IBM has also indicated a willingness towards providing support and gateways to SNA.

- In late 1986 IBM announced products for Ethernet compatibility.
- IBM will most likely provide increasing support for OSI standards. It may be that Europe will be the testing ground, and it's likely that the first announcements will focus on the middle level, S/36, S/38, and 9370.

The IS executive should take comfort in the fact that a rich array of products will be available to connect the two vendors' products over the next five years.

D

Data Base Environment

IBM continues with a dual product focus for data base, IMS, and DB2. IMS for high-volume transaction processing is being substantially improved to deal with higher and higher transaction rates. With over 6000 IMS licenses out there, IBM will continue to develop and enhance the product.

DB2 is and will continue to be the flagship relational offering and a key product in the SAA suite.

- Future releases will offer significant improvements in speed and efficiency, capable of handling traditional transaction processing applications in all but very high-volume shops.
- The product will be migrated to 9370 and PC hardware platforms, and while the implementation will be different under the covers, DB2 will be the first IBM data base product capable of running on all key SAA platforms.

A key drawback to the current DB2 offering is the lack of a complementary data dictionary product. It remains to be seen what IBM will do to plug the gap.

Another issue on which IBM has not fully disclosed its hand is distributed data base. There will clearly be a market for such products, and it's likely that IBM is well into development and test. It could be that it will continue to watch the market as ORACLE and others do the testing.

When IBM does announce a distributed data base product, DB2 will be the "engine."

DEC offers its data base management software as part of its integrated product architecture. Like IBM, it has offerings supporting both hierarchical and relational topologies. Relational Data Base (RDB) has been a successful product for DEC and, as is the case with IBM's DB2, will provide the platform for DEC's further development of data base software.

In addition to its own offerings DEC has actively encouraged third-party development of data base software products. Almost every major third-party relational product runs on the DEC VAX/VMS architecture. In fact, at present DEC has INGRES (a third-party offering) on its order form.

In the near future DEC is likely to announce RDB2 as its own distributed data base management offering. If so, the product will likely go head to head with some of the third-party offerings such as ORACLE and INGRES.

From a user's perspective the most significant thing to know about both vendors' relational data base offerings is that they will support Structured Query Language (SQL). IBM participated heavily in the ANSI/ISO SQL standards efforts and is already working on the follow-on. And DEC has expressed its commitment to SQL as well.

Outside the realms of DEC and IBM, SQL has also become the key link pin for a majority of third-party products, including:

- Data base management systems (DBMSs).
- Fourth generation language products (4GLs).
- Data base machines such as the Teradata.

While not universally or consistently implemented, this commitment to SQL provides a rich set of alternatives for IS executives. Exhibit IV-6 summarizes the primary approaches that will be available in the data base arena.

EXHIBIT IV-6

DATA BASE ENVIRONMENTS

- IBM to Support DB2 on PC and 9370
- DEC Will Announce Distributed Relational Data Base
- Third Parties Will Use Both DEC and IBM Offerings As Engines for:
 - Distributed DB Management Systems
 - Fourth Generation Languages
- There is a Common Commitment to SQL (Structured Query Language)

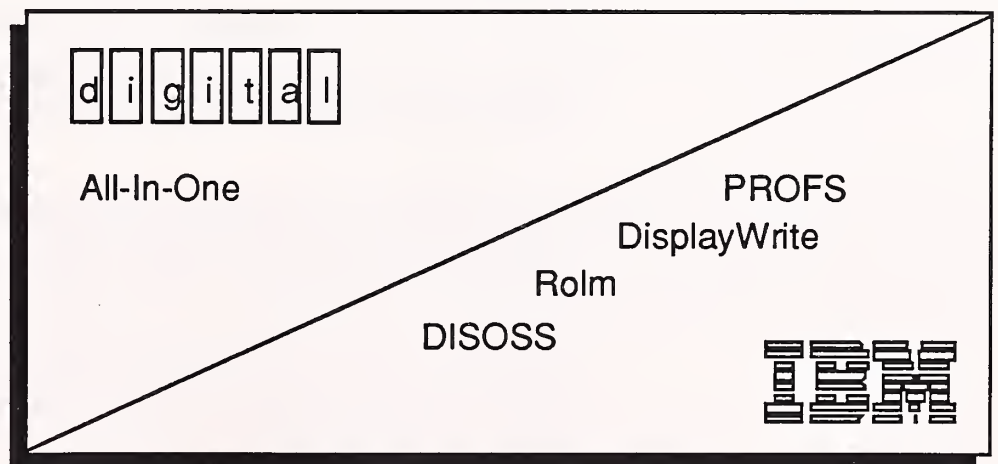
E

Office and Personal Productivity

Increasingly, the desire to integrate office functions, including messaging, text creation and management, voice messaging, and personal support, with traditional or departmental processing is a driving factor for IS executives. IBM and DEC have substantially different approaches in this area, as illustrated in Exhibit IV-7.

EXHIBIT IV-7

OFFICE SYSTEMS All-In-One or One Of Everything



It's hard to argue that IBM has anything resembling an integrated office product offering. DISSOS, PROFS, and DisplayWrite form the core of IBM's strategy, but it's hard to believe that the three will ever come together into one cohesive offering. DEC, on the other hand, has had significant success with ALL-IN-1.

Perhaps DEC's strength in the office area comes from the fact that they have always approached the user directly, and not from the viewpoint of the central MIS function. While far from a perfect solution, ALL-IN-1:

- Provides an integrated view of messaging, text creation and management, and file handling.
- Supports transparent (to the user) transmission of mail, spreadsheets, or text files over both X.400 circuit-switched or X.25 packet-switched protocols.
- Clearly outperforms the primary IBM offerings of PROFS and DISOSS for most office functions.

On the other side of the coin, DEC seems to have no strategy in the area of voice. It's debatable whether the IBM/ROLM team-up has contributed much to IBM's integrated office strategy so far, but the alliance with ROLM could be a positive influence in the long run.

F

Science and Engineering

IBM is viewed by many as having fallen way behind in this arena, but should not be counted out. It still shares the lead in this aspect of computing with DEC.

- Having made significant research investments in RISC architecture (on which the 9370 is based), IBM is capable of playing in the heavy-duty engineering workstation game. The PC/RT is still a viable product, and we can expect to see enhanced versions in the near future.
- IBM now has the upper end of the PS/2 line as a potential engineering workstation as well.
- Although DEC's recent joint development agreement with Cray should significantly improve its position, IBM boxes still front-end more supercomputers than any other manufacturers.
- Improved connectivity between DEC and IBM probably works to IBM's advantage in penetrating DEC's stronghold in the engineering and manufacturing area.

- The announced availability of the Manufacturing Automation Protocol (MAP) on the 9370 this fall puts another arrow in the quiver.
- IBM is also making a renewed push at the academic market. Remaining open-minded to Ethernet and Unix and committed to more open communications, it is likely to be successful.

DEC has a strong background in science and engineering and continues to move forward in this area. Much of the innovative technology in this arena has come from DEC and third-party developers.

- DEC has recently introduced a new engineering workstation to get back on the desktop.
- McDonnell Douglas recently announced that it would stop packaging its CAD software for DG and would go instead for DEC and IBM.

So, both vendors play strong hands in the area of scientific and engineering processing with DEC having the lead at the moment.

G

Software and Professional Services

Chapter III discussed the broad commitment of both vendors to significant participation in the software and professional services business. Section B of this chapter focused on the positions of IBM and DEC on applications software in particular. This section will cover a few remaining points on this topic.

In addition to the applications software discussed in Section B, both vendors will be making significant investments in operating system enhancements, applications enabling software such as DBMSs and networking software.

Evidence of IBM's commitments in this area include:

- The recent addition of over 6,000 employees to its software development staff, making the total count somewhere between 25 and 30 thousand, or about 7% of its work force.
- The introduction in June of 1986 of a Cooperative Marketing Program which will provide for the marketing of third-party software under its "native" logo. (It is estimated that 50% of the \$1.5 billion that IBM brought in last year from sales of applications software came from commissions on sales of third-party products.)
- An overhaul of its management structure to better coordinate the strategy for the development and marketing of software.

DEC has made commitments similar to IBM's. However, third-party developers are still uneasy with DEC's internal strategy for software development. Recent declarations from DEC about going "directly to the end user" could suddenly place DEC in the position of looking like a competitor rather than the "cooperating partner" that DEC has been in the past. While INPUT feels this issue can be resolved over time, it will probably be more difficult for DEC to handle than IBM.

Finally, each vendor sees itself playing an increasing role in the professional services arena. Both will likely focus on the high stakes/high margin systems integration market. From a user's perspective, this offers some alternatives for dealing with internal integration problems from two vendors who are rapidly developing in-house expertise in the management of multiple vendor systems projects.

H

Field Service and Support

A major part of the reason that IBM and DEC have been successful at growing to predominance as the leading vendors of computer systems has been their ability to provide maintenance and support services to their customers. Historically, the initials "IBM" became synonymous with "customer support." More recently, DEC has demonstrated its own recognition of the value of service and support, both as a contributor to the sales process and, more importantly, as a significant source of revenues in itself.

1. IBM

IBM service is provided out of its National Service Division. NSD employs an estimated 30,000 employees worldwide, two-thirds of whom are hardware or software engineers. Service contributed over \$7 billion in 1986, placing NSD 47th in a Fortune 100 if NSD was considered a separate entity!

In a strategic sense, service is treated as a "sales feature" for moving IBM boxes. As such, IBM has only begrudgingly offered its service on non-IBM products, currently limited to microcomputer peripheral products one might expect to see attached to an IBM PC-family CPU (eg. AST boards, HP laser printers, etc.). As mentioned earlier, IBM has indicated that it will begin to support a broader range of hardware. However, it is not clear at the moment exactly which products or with what level of service.

IBM recognizes the importance of its leadership role has on the service industry and frequently establishes policy and pricing positions that become the "de facto" industry standards as a result. IBM pricing changes frequently result in reactive changes by others in the industry, often to the detriment of the competitors who usually do not have the

ability to make up revenue dips through sales of other services or improvements in service efficiency. For example:

- IBM's Corporate Service Amendment of 1986 provides significant price reductions to users who are willing to assume first-level diagnostic responsibility.
- The introduction of a three-year warranty policy on a new family of terminals (3162) effectively removes these terminals from third-party maintenance (TPM) competition.

But regardless of the impact of IBM's policy and practice on TPM, the most significant fact for users is IBM's ability and focus on providing the highest quality of service and support, usually at extremely competitive prices. The net effect is intense customer loyalty.

IS executives can expect to see IBM aggressively moving forward with a number of other service and support offerings over the next five years.

- One obvious area for new service offerings will likely be software. The strategy complements IBM's major thrust in the applications software area and probably can contribute significant profit margins as a business unto itself.
- Telecommunications will be another area of increased focus. With Rolm in-house and an increasing commitment to systems integration, a strong strategy in telecommunications service and maintenance seems highly likely. IBM hints at this increased focus by offering a separate but clearly defined network support option as a part of its CSA and Mid-range Service Amendment service policies.

2. DEC

DEC provides hardware maintenance and software support out of a worldwide customer support organization that employs more than 30,000 maintenance and software support personnel out of 650 locations in 54 countries. DEC reported \$2.6 billion in service revenues in 1986, which represented a growth of 22% over 1985. More significantly, service now represents 35% of DEC's total revenues!

DEC views service more as a standalone business than as an inducement for selling systems and has operated service as a profit center for at least twenty years. This is reflected in DEC's aggressive marketing approach and the wide range of service options and levels available to customers.

DEC has also been quick to investigate and incorporate new service technologies that improve both service operations and profitability. For example:

- DEC offers around-the-clock telephone support supplemented by remote diagnostics out of 14 customer support centers. These support centers handle over 3,500 calls per day and successfully complete problem determination remotely on 85% of all hardware and software calls.
- DEC has been a leader in the development of artificial intelligence-based tools for problem diagnosis.

For DEC, competitive pricing is not as critical an issue as it is with other vendors, including IBM. DEC deals with price sensitivity with its expanded "menu" of service levels which allow the DEC user to choose the level that best fits their needs and budget.

Like IBM, DEC has begun offering service on over 175 "foreign" peripherals commonly attached to DEC systems in a program called DECompatible Service. As is the case with third-party hardware and software vendors, DEC walks a thin line as it tries to bring back in house the revenues from maintenance that formerly went to its cooperating third-party suppliers.

In light of these efforts to win back service revenues from TPMs, it is surprising that DEC has faced little legal reaction from the TPM industry, particularly since the DEC VAX product market appears so attractive to TPMs. This may be due in part to the availability of DEC diagnostic tools and software sold by such vendors as Parse, Inc., Emulex, and TRW, making it easier for TPMs to service DEC products.

DEC's concern over the use of diagnostic tools and software by the TPM industry is illustrated by a lawsuit filed by DEC against DSI Computer Services Inc., a \$3 million TPM company. It charged DSI had illegally used DEC's copyrighted diagnostic software in the servicing of DEC equipment. In July of 1987, DEC and DSI settled prior to trial, and neither company discussed the terms of the settlement other than that DSI agreed to pay an undisclosed amount of money for prior use of the software, that DSI would not make future use of the software, and that DEC is the owner of the duly registered copyrights of the software.

DEC also impacted the TPM industry with the decision to offer one-year warranties, first on VAX products and later on all systems. Although most TPMs tended to discount the effect of such a policy, the longer warranty does in effect decrease the "service life cycle" available on DEC products.

As one might expect from a company that prides itself on both its network capabilities and its wide range of service offerings, DEC makes available a complete list of network planning and support services, based

on over ten years experience with supporting its own 15,000 node EASYnet private network. These service can be provided with matching services from DEC's Software Services and Educational Services.



Meeting User Requirments





Meeting User Requirements

This chapter examines three aspects of the current user environment.

- Current user expenditure patterns.
- The motivating forces that will be driving IS requirements over the next half decade, and the implications for functional capabilities which these forces will exert on vendor offerings.
- The degree to which the developing product and business strategies of DEC, IBM, and third parties will provide support for meeting IS executives requirements over the next five years.

A

Current User Expenditure Patterns

While forecasts for overall hardware expenditures remain relatively flat, INPUT's own user surveys, as well as other industry-wide analyses, point out at least three trends which will impact the positions of DEC and IBM over the next five years:

- Expenditures for mainframes seem to be flat or declining as a percent of budget. Mainframes will be 7.4% of budget in 1987 as compared to 8.3% for 1986. Fortune 1000 companies who forecast 15.4% for mainframes in 1987 will actually spent around 11.9%.
- A growing percentage of the hardware budget is going to mid-level systems. Planned expenditures for 1986 were 8.2% and actuals turned out to be 10.2%. Higher numbers are forecast for 1987.
- Corporate spending on personal computers is still growing but at significantly slower rates than in recent years. The pipeline is gradually getting full. Micros currently consume about 6% of overall budget

dollars for large firms. However, corporate purchases of microcomputer software can be expected to be up sharply over the next five years as these systems become more integrated into the applications environment.

It may be that for the first time, expenditures for middle level processing capabilities for the average data processing shop will actually exceed those for large mainframe environments.

B

Issues Confronting IS Executives

There are many forces in today's environment shaping the issues confronting IS management. Four factors repeatedly identified in field surveys and the literature are:

- Advances in technology, particularly in the areas of data base management and middle level and micro-based systems and software.
- Increased recognition by corporate management of the potential of the IS function to make strategic as well as productivity contributions.
- Demands to decentralize general management responsibility and reduce costs without sacrificing the ability of the corporation to adapt quickly to changing business conditions.
- Growing user sophistication and involvement in the design, development, and operational management of their own information systems.

INPUT's 1987 annual survey of over 200 major corporations explicitly examined the impact that IS executives expect these forces will have over the next five years. Based on the responses, as well as an examination of other recent survey work, INPUT has identified nine major issues which it believes will dominate the planning and investment strategies of most IS executives between now and 1992. For analysis purposes the issues, summarized in Exhibit V-1, have been categorized into three groupings.

- Technology Integration - Covering infrastructure/network, user interfaces, and data.
- Management/Process - Dealing with IS productivity, user development, and support.
- Extended Capabilities - Utilizing new approaches and technologies for strategic advantage.

EXHIBIT V-1

KEY ISSUES FOR IS EXECUTIVES**TECHNOLOGY INTEGRATION**

- Infrastructure
- End-User Interfaces
- Data Environments

MANAGEMENT/PROCESS

- User-Managed Development
- Productivity of the IS Function
- Simplification of Support

EXTENDED CAPABILITIES

- Applications Architectures
- Artificial Intelligence & Expert Systems
- Strategic Systems

The remainder of this chapter is devoted to examining the issues in more depth and determining how well the evolving strategies of DEC, IBM, and third parties will address them.

C**Technological
Integration**

The three issues in the category of Technological Integration are:

- **Infrastructure** - In order to adapt to rapidly changing demands and set the stage for the integration of traditional and office systems, IS management will need to focus more on implementing a single underlying network and core software which can support office, transactional, and end user systems.
- **End-User Interfaces** - Most user organizations find themselves with a variety of workstations, interfaces and procedures to address their requirements for office, transactional, and management information systems. The rising cost of supporting this type of environment demands that IS management strive for integration of these capabilities through a consistent workstation interface.
- **Data Environments** - Many firms have just begun to address data management issues. The availability of technology and processes to support an integrated view of data is a major concern for IS management, particularly under increasing pressure for decentralization.

The strategies of both vendors assure excellent support in all of these areas. DEC's current VAX/VMS offerings provide the highest level of "off the shelf" infrastructure integration. The fact that the design of the VAX product line provides application portability and connectivity across multiple platforms insures a superior level of integration. IBM's Systems Applications Architecture (SAA) will put into place the same kind of capability across its product line. The first challenge for IBM will be to deliver an applications set, office, for example, that provides a practical demonstration of the SAA design concept. Finally, both vendors are taking a strong position in network management, a key component in the establishment of an integrated infrastructure.

In the area of end-user interfaces DEC again has the lead at present, although, as with the infrastructure issue, SAA will permit IBM to gain ground rapidly. Keyboard standardization on the new PS/2 line along with the adoption of graphical interfaces over time will give IBM the capability to deliver a very sophisticated tool set for standardization at the user interface.









Neither DEC nor IBM currently holds the answer to the desire for a truly integrated view of the data environment. However, third parties are taking a strong position in this technology and will continue to do so in the foreseeable future. Both IBM and DEC are moving to more common foundations in the data base area which will support the evolution of an integrated view of data over the next five years. Evidence can be seen in:




- The adoption by IBM of DB2 on all major platforms and the inclusion of the product under the umbrella of SAA.
- The acceptance by both DEC and IBM of SQL as a primary bridge between data "engines" and applications tools.
- The development of both relational and distributed data base products by third-party vendors which will utilize gateways to both DEC's and IBM's foundation DB products.

As summarized in Exhibit V-2, the future looks good for IS executives who have technology integration as a primary objective over the five-year planning horizon.

EXHIBIT V-2

TECHNOLOGICAL INTEGRATION

ISSUE	RATE	SUPPORTING STRATEGIES
Infrastructure		DEC - Integrated Product Architecture Easy Migration
		IBM - System Applications Architecture
User Interfaces		DEC - Common Workstation Strategy Common Operating System
		IBM - Systems Applications Architecture PS/2 Integration
		
Data Base Management		DEC - Common DBMS On All Platforms Possible Distributed Relational
		IBM - SSA, DB2 On Multiple Platforms
		

 Strong Support
 Medium Support
 Neutral Support

D**Management/Process**

The management and process issues identified in the survey are somewhat more subtle to address. Resolution will require major management initiatives with developments in technology playing primarily a facilitating role. The primary management and process issues are:

- **User-Managed Development** - Increasingly, users are managing their own development. While this frequently results in systems which more effectively meet user needs, the end products seldom meet reasonable standards of integrity and maintainability. IS management will need new technologies and processes to deal with this trend.
- **Productivity of the IS Function** - Like all other parts of the corporation, IS is being called upon to demonstrate greater efficiency and productivity. Progress in the automation and simplification of the systems

design, development, and maintenance process along with more efficient management of the network and production environments will be critical.

- Simplification of Support - At all levels, support costs are mushrooming. Increased penetration of technology and a general lack of standards are major contributing factors. Products and services which require minimal investments in training and maintenance will play a key role in dealing with this issue.

While effectively harnessing the development capabilities of end-users is primarily a management issue, technology strategy can either facilitate or complicate the process.

- As more common tool sets appear on both IBM and DEC platforms, the process of cooperative development between traditional data processing and the end-user will be facilitated.
- The development of standard interfaces and common approaches to data access by both vendors will also help this process.

Both vendors as well as third parties are working to provide tools and technologies which will bring the processes of traditional and end-user development closer together. DB2 and SAA from IBM support the concept, and DEC's integrated product architecture essentially makes a common set of tools available on all levels of processing capability. How IS management selects the standards from these technology sets will be the determining factor in obtaining an effective approach to end-user development.

IS productivity for IBM shops will be significantly enhanced by early adoption of SAA. SAA will provide portability of code across multiple environments, standard interfaces for communications, data bases, and workstation management systems. DEC's unified product architecture already provides much of this capability. Other developments which will help increase IS's productivity as well as reduce support costs include:

- The growing availability of Computer Aided Systems Engineering (CASE) tools, 4GLs, and other applications enabling products in both the DEC and IBM environments.
- Simplification of support through standardization on end-user products and workstations.
- The commitment of both vendors to providing vertical applications and applications enabling software.

E

Extended Capabilities The user survey identified a wide variety of issues where IS executives felt advanced technology might offer solutions over the next five years. The most frequently mentioned were management of the applications portfolio, the application of expert and artificial intelligence (AI) technologies to operational and decision support systems, and the identification and implementation of “strategic” systems opportunities. These three are discussed in more depth below.

- Applications Architectures - Management of the applications portfolio is becoming increasingly difficult for several reasons.
 - Requirements to decentralize existing applications.
 - Growing inventories of departmental systems dependent upon interaction with centralized applications.
 - User demands for efficient access to the data contained in multiple applications systems.

To respond to these demands IS management will need to look to a consistent architectural description of the portfolio in order to understand the interrelationship between applications and the data environment.

- AI and Expert Systems - The next five years is likely to see a rapid growth in the number of these systems developed to support both operational and planning activities. To be effective, these systems will require easy access to data traditionally housed in the large mainframe. The ability to link the two will be a key factor.
- Strategic Systems - Although more has been said than done, many corporations are placing a major emphasis on deploying systems for strategic advantage. Many of these systems will rely on electronic data interchange (EDI) as a key component. This will further escalate the demand for standards in the hardware, software, and data communications environments.

Both DEC and IBM are moving forward on a variety of fronts which would indicate commitment to supporting these advanced requirements.

- IBM's Network Services organization is providing EDI services, a key component of many “strategic” systems.
- Software shells for the development of expert systems are available for both vendors' key platforms. INPUT expects to see the imbedded use of limited forms of AI within key applications products to support business operations from both vendors in the near future.

- The development of more powerful workstations (PS/2-386, and DEC's new engineering workstation) and the announced level of connectivity to support them will provide whole new platforms to support both AI and expert systems with the kind of connectivity required to extract data from corporate data bases.
- For IBM shops SAA provides a context which will permit IS executives to adopt an applications portfolio strategy which will simplify the development and distribution of applications systems for a variety of processing environments.

In general, while each vendor has its niches in the arena of advanced technologies, both DEC and IBM will be providing the basic connectivity, processing power, and operating environments necessary to meet IS executives' expectations for the application of advanced function.

F

The Role of Third Parties

Third-party suppliers, particularly of software, have been mentioned frequently throughout this report. Both IBM and DEC have utilized third-party strategies in the past and have stated directions to continue to do so. It is INPUT's contention that third parties will play a key role in providing many of the technologies required to address the issues identified in INPUT's survey of IS executives.

A good example can be seen in IBM's utilization of outside vendors as a key strategy in the roll out of the 9370. So far, according to a recent article, IBM has received over 16 packages and 96 commitments from third-party developers for programs for the new system. In other instances third-party vendors are providing bridges in office applications. Soft Switch enables PCs running Multimate to send revisable form documents to such diverse architectures as the System 38 and permits DEC's ALL-IN-1 to communicate with IBM systems.

In the case of DEC, third parties have been largely responsible for covering for DEC's abandonment of the DEC 10 & 20. Some of these vendors are even providing systems for the migration of programs and data to DEC's newer computers; Software House is an example. Other developments in the DEC arena include:

- The previously mentioned agreement between DEC and Cray for the marketing of the VAX Supercomputer Gateway System.
- Connectivity software between DEC and Apple products as mentioned in Section E of the previous chapter.
- Software from Odesta permitting the VAX to function as a data base server for networked Macintoshes running the Helix relational data base system.

As summarized in Exhibit V-3 and discussed in Chapter IV, third parties are playing a primary role in the areas of connectivity and applications software. However, it is INPUT's position that the area of highest impact is likely to be 4GL and relational data base offerings. Exhibit V-4 gives a sampling of some of the vendors who have significant 4GL and data base products which currently or will soon operate on both DEC and IBM environments. It is through these types of products that common user interfaces and uniform views of the data environment can be provided, whether the underlying architecture is DEC, IBM, or a mixture of the two offering migration paths previously not available.

EXHIBIT V-3

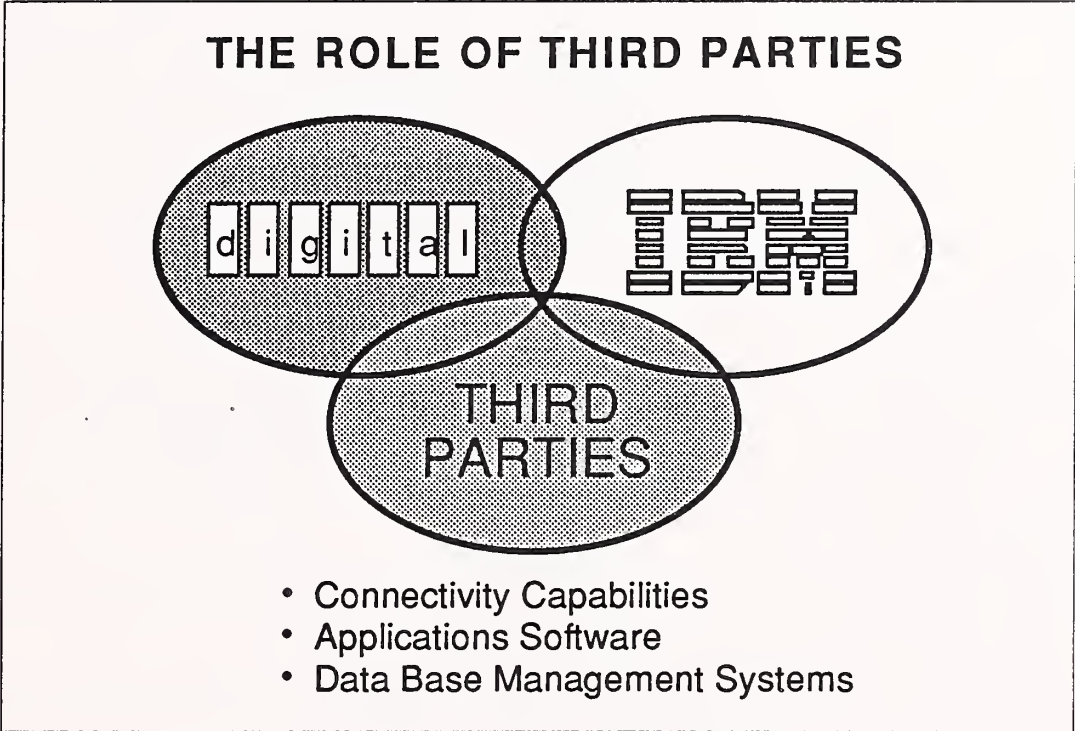


EXHIBIT V-4

**THIRD-PARTY SUPPORT
FOR DBMS AND 4GL
IBM & DEC**

VENDOR	PRODUCT
Cognos, Inc. Cincom Systems Information Builders Oracle Corp. Software AG	Powerhouse Ultra Focus Oracle Adabas

INPUT sees the role of third-party software providers in meeting the needs of IS management becoming even more significant over time. The acceptance of "C" as a supported compiler in SAA architecture will be another factor to motivate third parties to make products available across both vendors' product lines.

- Many software houses currently use "C" as the development language for their offerings.
- Support of "C" by IBM will allow products developed on any platform supporting "C" to be migrated to other IBM product's under the SAA umbrella.

With no one vendor providing the "total" solution (DEC and IBM included), third parties are becoming critical in planning for information systems. IS executives will need to give much more serious consideration to third parties as providers of primary applications and systems software packages to meet future needs.

G

Summary

While it's clear that not every IS executive will need to focus on all the issues discussed in Sections C through E, it seems apparent that most will need to adopt technology strategies which will give them maximum adaptability over time. This means IS executives will look to vendors that provide:

- Technological capabilities to support a greater variety of systems applications.
- Flexibility to respond to changing requirements for both capacity and distribution of function.
- Software and service offerings which minimize internal development requirements and provide capabilities to supplement those available in house.
- Connectivity between their own product offerings as well as with other vendors offerings.

All indications are that DEC, IBM, and third parties are working at providing the tools.



Conclusions And Recommendations





Conclusions And Recommendations

Throughout the report INPUT has presented many of its views on the direction of each vendor. This chapter summarizes INPUT's conclusions regarding DEC and IBM over the next five years and gives INPUT's recommendations for IS management.

A

Conclusions

1. IBM

IBM's sheer size and position in the market can never be discounted. It is INPUT's position that the current slump in earnings is only a temporary phenomena. Now at the end of its life-cycle on several product lines, and playing catch-up ball in meeting user demands for more integrated product offerings, IBM will need to devote tremendous levels of resources to restructuring both its products and its business approach to regain dominance in several areas of the business. There is little question, however, that both the commitment and resources are there.

- IBM's heavy investments in basic research have and will continue to serve it well. Much of what's "on the shelf" has yet to be turned into product.
- Its undisputed leadership in storage technology is not likely to be challenged. And, while less glamorous than the processor and software business, mass storage provides healthy profit margins with a minimal marketing and sales effort. It's conceivable that IBM could move to supply disk storage for DEC's and other vendors' products.
- In transaction processing IBM remains the uncontested leader and has recently made some moves to further its penetration. These include significant enhancements to Extended Architecture (XA) and IMS as well as performance improvements to DB2.

- IBM's heavy investments in the late seventies in rebuilding its manufacturing technology, plants, and facilities provide a solid platform for the delivery of new products at competitive prices.
- IBM's re-entry into the network services market and even its acquisition of Rolm (although of little apparent value to date) have postured IBM to take a stronger position than DEC in the emerging telecommunications products and services businesses.

Another area of strength for IBM is its ability to set or influence standards. Like it or not, it's easier to call the tune than to dance to the music. For example:

- While the IBM SNA structure has not been implemented in all specifics by the ISO (International Standards Organization) in its OSI (Open Systems Interconnect) model, ISO certainly bought the concept and has implemented a one for one seven-layer architecture which matches IBM's closely.
- Also IBM has set the standard in the document content arena. The two document architectures, RFTDCA (Revisable Form Text Document Architecture) and FFTDCA (Final Form Text Document Architecture), defined through IBM's DISSOS, have become de facto standards which the world by and large is following.

Above everything else, however, IBM's biggest asset over the next five years may well turn out to be a renewed business focus. While DEC may have provided significant stimulus, it is highly likely that IBM has concluded: "We have met the enemy, and he is us!" Evidence can be seen in:

- The adoption of an attitude of more open communications with customers and the industry in general.
- Increased competitiveness on large custom orders.
- The aggressive development of partnerships with major software vendors and its user community.
- A proactive stance in applications support, systems integration and other professional service offerings.

All of these factors coupled with the introduction of products and architectural strategies discussed earlier point to a strong position for IBM over the next five years.

2. DEC

From the point of view of performance DEC is “on a roll” until at least 1990. Although IBM has set the wheels in motion to close the gap, product architecture and inertia are on DEC’s side. With DEC being at the peak of its product cycle and IBM playing catch-up ball in the middle level processor arena, it’s unlikely that some significant reversal in the relative performance of the two companies will occur in the near future. The significant thing for IS management to remember is that neither DEC nor IBM shows any signs of going out of business.

Furthermore, it is INPUT’s position that the territory that DEC has taken from IBM in the last several years will remain its own despite new IBM products. IBM will have to displace DEC rather than defend the turf in a large number of accounts that used to be “true blue” and now have the option of mixing and matching.

On the other side of the coin, it won’t all be clear sailing. DEC will need to deal with a number of significant issues to maintain momentum.

- To make it more competitive in the area of transaction processing, Digital needs more powerful machines, special software, and better disk drives. Moving into IBM’s turf will be costly from both an R&D and a marketing standpoint.
- As personal computers become an accepted component of traditional applications solutions DEC will need to establish a new strategy in an area where IBM’s architecture has become the de facto standard.

But perhaps the most significant and delicate issue that DEC will need to deal with is its relationships with third-party software developers. DEC’s ability to leverage this community has been a key component of its success. As DEC seeks to take more of the profit margin associated with software sales it could potentially bite the hand that feeds it.

3. The Common Ground

a. Connectivity

Although both DEC and IBM at times have made public statements indicating a lack of interest in honoring each other’s evolving connectivity standards, both vendors, as well as third parties, are making it happen. Both recognize the need to provide support for multi-vendor networks, and the likely result will be a rich tapestry of options for mixing the two architectures over the next few years. Users will become increasingly comfortable with integrated solutions involving DEC and IBM products.

A similar situation applies in the area of data management. Even though DEC and IBM are not likely to provide it, third parties are already selling 4GL, database management, and distributed data base management software with standard user interfaces which will operate on both DEC's VAX/VMS and a subset of IBM's MVS/VM and PC-based products. As SAA unfolds, it is likely that these products will migrate to more of IBM's product line. While the implementations vary significantly under the covers, they will provide connectivity at the data level between DEC and IBM which has previously been lacking.

Finally, both vendors remain heavily involved in the support of various standards efforts which over time will facilitate even higher levels of connectivity. Open Systems Interconnect (OSI) and the evolving SQL standards are just two examples. In addition, each vendor's network management products will ultimately support networks of heterogeneous processing nodes.

All these factors point to a higher level of usable connectivity between DEC and IBM over the next five years.

b. Support and Service

IS executives can also expect to see increased recognition on the part of both vendors of the need to support and provide service for mixed vendor networks.

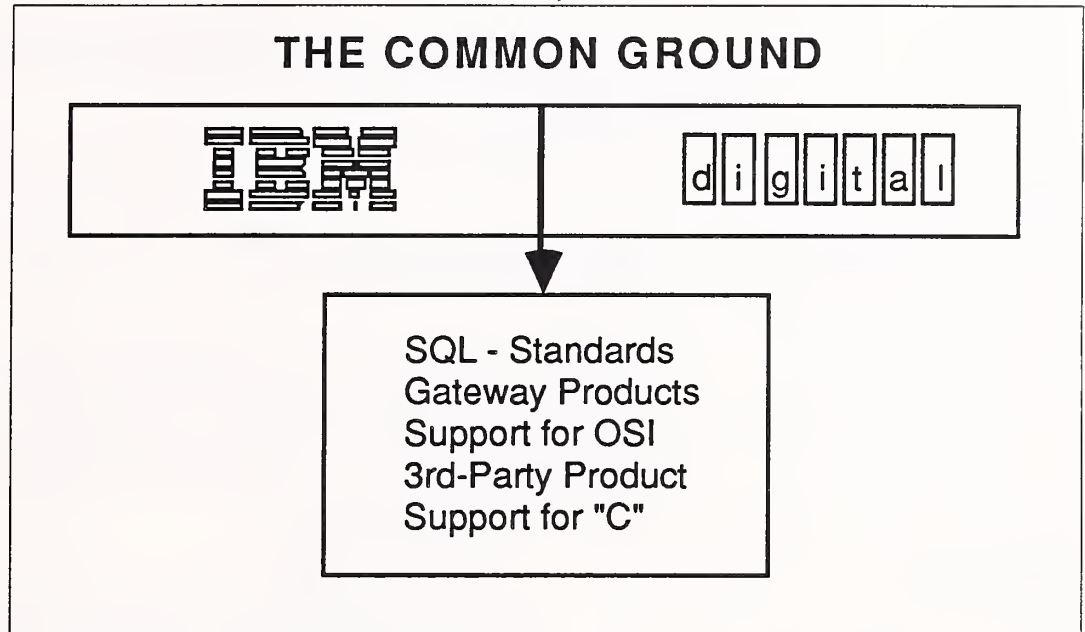
- They are already servicing each other's equipment under certain circumstances.
- Increased commitment to participating in the Systems Integration marketplace will demand that each vendor be capable of making a mixed architectural environment work.

c. Bridging Technologies

In addition to the basic positions of each vendor on the connectivity and data base issues, both vendors as well as third parties will look to key technologies to facilitate tighter integration. Exhibit VI-1 lists several which form the basis for greater connectivity between DEC and IBM. Either directly or indirectly, these technologies provide for:

- The migration of common applications enabling software products such as 4GL's, data base management systems, and CASE technology between the two architectures.
- The logical distribution of applications and data across both.
- The de facto standards for third-party developers.

EXHIBIT VI-1



All the conclusions reached would point toward a richer set of options for IS management. The remainder of this chapter will examine the implication of these trends and present INPUT's recommendations for IS executives.

B**Implications**

INPUT believes that the technology and business strategies of DEC, IBM, and third-party vendors will provide a broad set of practical alternatives for effectively integrating vendor offerings over the next five years. However, many IS organizations which have traditionally been either IBM or DEC shops may lack the expertise to evaluate or implement these options effectively. Consequently, IS organizations seeking to take advantage of these capabilities will need to reconsider:

- Their policies and strategies with regard to a commitment to integrated multi-vendor environments.
- The internal planning and evaluation process.
- The capability and mix of internal staff required to effectively evaluate and implement solutions which leverage the potential of multi-vendor solutions.

For IS executives confronted with basic decisions regarding the centralization or decentralization of processing and data, the next five years will provide options to go in both directions and with both vendors' product lines or a mixture of the two. The available product offerings will be there to support:

- The decentralization of applications and/or data from large host-based IBM environments to distributed IBM or DEC environments.
- The integration of satellite DEC systems into DEC/IBM networks.
- The design of new applications systems leveraging the strengths of both vendors' architectures.

The implications summarized in Exhibit VI-2 clearly indicate that IS executives will have the capabilities to deal more effectively with the the key issues discussed in Chapter V. However, many will need to rethink basic strategies, processes, and internal staffing to take effective advantage of the alternatives.

EXHIBIT VI-2

IMPLICATIONS FOR IS MANAGEMENT

- More Options to Choose From
- Clearer Paths for Migration
- Improved Opportunities for Integration
- Support for Decentralization
- A Chance to: PICK THE BEST OF BREED

C

Recommendations

INPUT's general recommendations for IS executives are summarized in Exhibit VI-3. Some more specific thoughts follow.

For IS executives interested in leveraging the likely future options involving both vendors and third parties, there are a number of recommendations which INPUT feels are appropriate.

- Review the current in-house strategy with regard to IBM. It seems clear that the course of maximum flexibility will be to focus the IBM decisions on hardware, software, and applications that will be included under the umbrella of Systems Applications Architecture. These technologies will be the ones supported by outside suppliers and will offer the greatest opportunity for future flexibility.

EXHIBIT VI-3

**RECOMMENDATIONS
FOR IS MANAGEMENT**

- Mixing and Matching - Viable and Effective
- SAA- The IBM Tool Box
- Third-Party Products to Fill the Gaps
- Focus on Building the Infrastructure
 - Connectivity
 - Data
 - Standards

- If both DEC and IBM are already part of the environment, consider the use of relational data base systems that run on both vendors' products or provide gateways to both IBM's and DEC's relational data base offerings.
- Evaluate and select standard gateway and other connectivity products to support the construction of an integrated infrastructure.
- Begin work on an applications architecture which will establish the appropriate level in the company's multi-nodal network for various applications, development tools, and data.
- Determine, and if necessary act on, the staffing requirements necessary to support a multi-vendor infrastructure.

In situations where there is no compelling reason to consider a tightly integrated mixture of IBM and DEC environments IS management should consider the following:

- It's unlikely that a bad decision can be made by focusing on the dominant vendor currently in-house and sticking with the chosen vendor's mainstream product line, although to obtain maximum future flexibility, it would be prudent to consider network and core software strategies which provide the option of a multi-vendor scenario at a future date.

- For IBM-based shops INPUT strongly recommends keeping current on the development of SAA, the 9370, and, in particular, IBM's emerging office strategy.
- In the case of DEC, consideration should be given to its evolving position with regard to personal computers and their inclusion in the architecture, as well as its success in expanding into the high-volume transaction processing environment.

Whether focused on DEC or IBM, options should be kept open to take advantage of particular niches of capability that each vendor has in the marketplace. It is INPUT's view that the DEC - IBM wars will largely work to the benefit of the user in the long run. IS management will soon have a large variety of alternatives to choose from, allowing it to pick the "best of breed."

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